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A SYSTEMS APPROACH TO TQM FOR INTEGRATING QUALITY AND ENVIRONMENTAL MANAGEMENT

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ABSTRACT

Total Quality Management (TQM) is both enthusiastically praised and severely criticised in the management literature. The current study discusses various problems related to TQM and suggests a model for TQM to attempt to alleviate these problems. This model integrates quality and environmental management basing the system on a combination of the ISO 9002 and ISO 14001 standards. A number of perspectives, which are consequences of the model, are discussed, including *integration*, *participation* and *multi-criteria decision making*. Different strands of Systems Theory are presented as providing insights that should assist in successfully addressing these perspectives. General Systems Theory is described as providing perspectives regarding integration and Soft Systems Thinking as providing perspectives regarding participation. Multi-Criteria Decision Making (MCDM) methodologies are not normally seen as part of Systems Thinking but the compatibility of these two approaches is argued and the utility for TQM of the link between MCDM and Systems Thinking indicated. Critical Systems Thinking is suggested as providing the theoretical perspectives to define a multimethodology framework linking three methodologies, Soft Systems Methodology (SSM), Strategic Assumptions Surfacing and Testing (SAST) and Analytic Hierarchy Process (AHP). This framework is suggested as providing the diversity of perspectives needed to promote participation in the process and to give a sense of direction in the multifaceted management intervention on the problem of progressing toward a combined ISO 9002/14001 system.

This framework was implemented at Mondi Kraft, Richards Bay Mill via three workshops following an Action Research based process. This process is described and the data emanating from the workshops analysed and discussed. The process succeeded in the objective of promoting organisational learning on two levels. First, the introduction of the three new methodologies increased management knowledge by providing extra problem solving methods. Second, the issues and models discussed during the workshops heightened management awareness of quality and environmental matters across a wide front and, through the AHP ratings, management was able to prioritise these issues for later action. A number of recommendations and items for possible further research flowed from this study and are discussed.

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INTRODUCTION

1.1 BACKGROUND TO THE RESEARCH

Total Quality Management (TQM) emerged during the 1990s as one of the most widely-known quasi-scientific disciplines in business administration and management studies, as part of a movement towards redefining management ideology on a global basis. More managers than ever before are focusing on quality as a way to increase productivity, reducing costs and meeting customer needs. TQM is widely recognised and used as a work design strategy and having grown from modest quality control at the start of the century, has become one of the most popular change movements in management during the past decade. The beginnings of TQM is often attributed to the work of W Edwards Deming who along with Juran assisted Japanese organisations to realise the importance of quality as a manufacturing and marketing tool [Holmes, 1992]. TQM seeks to align the whole organisation behind the quest for quality in products and services.

The importance for organisations to be seen as 'environmentally friendly' by their customers is perceived as extending competitive advantage and hence the interest in ISO 14000 certification from a strategic management standpoint. The increased pressure from various sides on companies to pay more serious attention to environmental management has been noted and, therefore, aligning the whole organisation behind sound environmental performance, as for quality, points to a TEM (Total Environmental Management) approach. The logic of combining these two important aspects of management into a single system emphasise the importance of environmental management within a TQM framework.

TQM has been, on the one hand, hailed by business leaders and theoreticians alike as a panacea to many business ills. The PIMS (Profit Impact of Market Strategies) research demonstrates that when superior quality and large market share are both present, profitability is virtually guaranteed [Buzzell & Gale, 1989]. On the other hand, more recently, TQM has been slated by the business literature as 'not delivering the goods' [Economist, 1992 : 69]. Some evidence suggests that in certain cases in which companies have performed poorly in the management of quality it is not that the intentions, efforts and resource commitments being directed towards TQM initiatives

have been flawed, in fact research indicates quite the contrary. Instead, the flaw may be in the design of the overall approach and specific implementation efforts [Chang, 1993 : 23]. Based on the literature, it appears that where TQM is not performing well, it is in many cases, a result of implementing a traditional TQM strategy in a business environment which is very different from what it was just a decade ago. Where the nature and environment of business is changing at an ever increasing rate, TQM as a business strategy has, in many cases, not kept pace [Niven, 1993].

The 'flaws' referred to above can be grouped into two main categories. First, some general problems can be identified in the literature. These include;

(i) TQM is not clearly defined and the plethora of definitions can lead to TQM processes being hampered (cf [Sullivan, 1986b] and [Crawford, 1992]).

(ii) Clear benchmarks to measure progress along the TQM route are not always available (cf [Flood, 1993]; [Murphy, 1995]; [Ferguson, 1995] and [Green & LaFontaine, 1996]).

(iii) TQM is often narrowly defined in terms of quality only with the exclusion of environmental management. The rapid increase in emphasis on environmental issues constitutes one of the changes on the business environment to which TQM approaches must adjust (cf [Oakland & Porter, 1995]; [Welford, 1995]; [Lamprecht, 1996] and [Carruthers, 1996]).

Second, Mondi Kraft, the organisation on which this research project is based, identified five problems that were actually experienced earlier in the company's ISO 9002 implementation. These problems were seen by Mondi Kraft Management as potential problems in any process of including an ISO 14001 Environmental Management System into their existing ISO 9002 Quality System, as part of progress toward TQM. It was felt that an implementation framework is required that will be able to overcome these potential problems and assist in successful implementation of a TQM programme. The problems identified were: (i) A Limiting Focus; (ii) Lack of Participation and Ownership; (iii) Existing Cultures and Systems undervalued; (iv) Conflicting Objectives; and (v) Resistance to Change.

1.2 GOALS OF THE STUDY

The goal of this study will be to define and test a multi-methodology framework for assisting in the implementation of TQM, in an attempt to address several problems previously identified for TQM programmes.

This goal can be divided into two subgoals:-

(i) Define a framework in such a way as to address anticipated problems, both general problems identified in the literature and specific problems experienced by Mondi Kraft in the early stages of their TQM programme.

(ii) Test this framework in an action research based project at the Mondi Kraft Richards Bay Mill to determine its success in alleviating the anticipated problems.

1.3 RESEARCH SCOPE AND DELIMITATIONS

The research is applicable to the Pulp and Paper Industry assuming a combined application of quality and environmental management and further assuming that the International Management System Standards, ISO 9002 for quality and ISO 14001 for environment, should form the basis of TQM efforts. A similar argument for including Occupational Health and Safety (OHS) Management into the TQM system can be advanced as that argued below for combining quality and environmental management. This study, however, will limit the discussion to the latter two, because including OHS Management would have resulted in a too bulky and diffuse subject. Expanding the research to address the OHS Management inclusion is suggested as a subject for further research.

1.4 RESEARCH METHODOLOGY

1.4.1 THEORETICAL ASPECTS

To achieve the objective of defining a framework for TQM implementation that would be able to overcome the problems experienced and anticipated with many TQM programmes, it would be necessary to do a thorough literature review. This review

should not only identify the problems experienced and possible solutions, but should also critically examine these solutions to determine theoretically sound approaches. The research will accept as guiding principles that different methodologies have different strengths and weaknesses and that by applying a pluralist approach the strengths of one method can be used to offset the weaknesses of another. For this reason the strengths and weaknesses of several approaches need to be explicated in a critical review and a framework constructed that would achieve the best overall effect by utilising the uncovered strengths. It is further important that the suggested framework links perspectives from the TQM literature with perspectives from the systems literature. As recent as 1994 the observation was made that there is 'hardly any' work done to study the relationships between TQM and Systems Theory [Mulej & Rebernik, 1994 : 7]. This study assumes that a framework built on a critical combination of perspectives and methodologies from these two fields will have utility in overcoming many of the 'flaws' reported on more 'traditional' TQM programmes.

1.4.2 PRACTICAL ASPECTS

The research will report on an Action Research project in which the framework was implemented in a real organisational setting at Mondi Kraft, Richards Bay Mill. The project was an attempt to facilitate a process of organisational learning, seen as a necessary prerequisite for the change from a system based on ISO 9002 only to a combined ISO 9002/14001 system. Organisational learning was affected on two levels, first by the introduction of the systems methodologies to management, and second, by using these methodologies to elicit managerial views on issues that need addressing, rate the perceived importance and urgency of these issues and identify possible solutions relevant to these issues.

The problems identified as possible hindrances to successful TQM implementation was used as yardsticks and the framework was evaluated by reporting both the successes and failures of the framework in alleviating these problems. Three important aspects of the research methodology are: (i) The *action* element of Action Research was actively pursued, ie an actual organisational transformation process was initiated, (ii) The *research* element of Action Research was used to test the theoretical framework and in this way produce research information that can lead to the improvement of the framework and possibly to the application of similar approaches in other organisational contexts and (iii) The research was performed based on a Participant Observational

approach in which the researcher avoided any attempt to observe the behaviour of fellow managers in a detached, covert, so called 'value-free' way, but took an active, transparent role in the process instead.

1.5 IMPORTANCE OF THE RESEARCH

The research is important in terms of both facets of Action Research. First, the *action* aspect is particularly important to Mondi Kraft. The Management of this Pulp and Paper Mill has decided to pursue the TQM route to maintain competitive advantage. Both excellence in quality of products and services and in sound environmental management are regarded by the managers as necessary to achieve such competitive advantage and the process to achieve ISO 14001 in addition to ISO 9002 is, therefore, seen as essential.. Any assistance that can help to realise this goal is important particularly against the background of the claimed failure of many similar processes (cf [Sitken, et al, 1994]; [Holoviak, 1995]; [Powell, 1995] and [Westphal, et al, 1997]). The research assists in this regard in two ways:

(i) It provides Mondi Kraft with a framework that is seen as having utility in TQM implementation and with the knowledge of the separate methodologies included in the framework, methods which were not known and used in Mondi before.

(ii) The research formed part of the actual initial stages of the implementation. In this regard it afforded Mondi Managers with the opportunity to identify issues relevant to the TQM process, rate these issues in terms of their perceived priorities and evaluate different approaches and models relevant to the joint ISO 9002/14001 system. In all these activities the research provided actual organisational learning opportunities and raised management awareness across a wide front. Both the learning and awareness are seen as necessary prerequisites for successful organisational change required for the transition from ISO 9002 to TQM [Petkov, et al, 1998].

Second, the *research* aspect too, provided specific benefits. Against the background of the claimed failure of TQM, it is important that research is actively aimed at providing and testing new perspectives, models and frameworks to improve the success rate of TQM programmes. This research is an unique attempt to combine several TQM and Systems Theoretical perspectives and, using critical pluralism, combine several systems methodologies to provide a new framework and approach. It is, therefore, important to

test this framework as part of the ongoing activity of improvement in management theory and practice [Dean & Bowen, 1994].

1.6 DISSERTATION OVERVIEW

1.6.1 CHAPTER 2 - TQM PERSPECTIVES

This chapter will be a literature survey of various aspects of TQM. First, the problems regarding TQM, referred to above, will be discussed, followed by a discussion on the theoretical aspects required in a framework for overcoming these problems. This will include the definition of a Model for TQM, integrating both quality and environmental management and linking the International Management Systems Standards, ISO 9000 and ISO 14000 to TQM. The advantages of basing TQM efforts on these Standards will be discussed, particularly emphasising that these Standards provide the milestones against which progress toward TQM can be measured *internally* by the organisation and *externally* demonstrated to customers and other stakeholders. The chapter concludes with a discussion of the consequences, to management, inherent in this TQM model. These consequences include: (i) A *Systems Approach* to address the *Integration* principles required to achieve simultaneous and coordinated attention to quality and environmental standards; (ii) An *Interpretive Approach* to address the requirements of honouring the principles of *Participation* and *Diverse Viewpoints* inherent in an approach within which a large number of stakeholders are involved and (iii) *A Multi-criterial Decision Making Approach* to address the fact that including, on the one hand, both quality and environmental management and on the other hand, both 'hard' (technical) and 'soft' (human resource) issues into a common system like TQM, leads to the need to simultaneously satisfy diverse, often conflicting, objectives.

1.6.2 CHAPTER 3 - SYSTEMS PERSPECTIVES

This chapter will present a literature survey and discussion on various Systems, Theoretical issues and how they apply to the study of organisations. Several Systems Approaches will be discussed, including the Organisations-as-Systems Approach, the Hard Systems Approach and the Soft Systems Approach. The chapter will conclude with a discussion indicating the advantages to be gained by following a complementarist approach in which the three approaches above are integrated, and will suggest the

Critical Systems Approach as providing the framework to achieve a coherent and justifiable pluralism.

1.6.3 CHAPTER 4 - A FRAMEWORK FOR INTERVENTION

This chapter will integrate the TQM perspectives presented in Chapter 2 with the Systems perspectives discussed in Chapter 3. The compatibility between TQM and the different Systems Approaches will be discussed. A framework based on a critical complementarist use of three systems methodologies, ie Strategic Assumptions Surfacing and Testing (SAST), Soft Systems Methodology (SSM) and Analytic Hierarchy Process (AHP) will be introduced. Each of these three methodologies will be discussed in terms of their (theoretical) utility for TQM in general and the TQM consequences, identified earlier, in particular. The chapter will conclude with a discussion of the research methodology to be used in the framework implementation, indicating that it would be an Action Research based project including data sourced through Surveys, Interviews and Participant Observation techniques.

1.6.4 CHAPTER 5 - DESCRIPTION AND ANALYSIS OF THE FRAMEWORK IMPLEMENTATION

The Action Research project, in which the suggested framework was implemented at the Richards Bay Pulp and Paper Mill of Mondi Kraft will be described and analysed. This project consisted of three workshops involving 20 managers from the Mill. These workshops, the views of the managers and data emanating from this project will be analysed in terms of the anticipated problems identified and in terms of the extent to which these problems were overcome by the particular framework.

1.6.5 CHAPTER 6 - CONCLUSION: EVALUATION OF THE PROPOSED FRAMEWORK FOR INTEGRATING ISO 9002 AND ISO 14001

This chapter will present a short evaluation of the implementation of the framework both in terms of successes and failures to achieve the objectives. Items for further research will be identified and final conclusions drawn.

CHAPTER 2
TQM PERSPECTIVES

2.1 INTRODUCTION

Total Quality Management (TQM) emerged during the 1990s as one of the most widely-known quasi-scientific disciplines in business administration and management studies, as part of a movement towards redefining management ideology on a global basis. More managers than ever before are focusing on quality as a way to increase productivity, reducing costs and meeting customer needs. TQM is widely recognised and used as a work design strategy [Manz & Stewart, 1997] and having grown from modest quality control at the start of the century, has become one of the most popular change movements in management during the past decade [Sitkin, et al, 1994].

Although emphasis on quality control and standardisation dates back to early Egyptian, Greek and Roman standards for building, trade and commerce, the first generation of systematic discussing about quality took place just before and after World War II. These discussions concentrated on the importance of leaders detecting errors and reducing the cost of production. The focus was more narrow than current TQM efforts and can be characterised as 'reactive' [Alvolio, 1994] or 'defensive' [Garvin, 1987].

Throughout the 19th century, the development of gauging and control systems became increasingly more refined and sophisticated. Emphasis was placed on post hoc inspection, control and evaluation of product quality - a pervasive trend that would continue well into the current century.

Not until 1922, when GS Radford wrote *'The Control of Quality in Manufacturing'*, were inspection and quality operationalised as a distinct and independent responsibility of management. The solid scientific basis for quality control, however, did not emerge until 1931 with the publication of *'Economic Control of Quality of Manufacturing Product'* by WA Shewart of Bell Laboratories. Shewart's work at Bell on process control, as well as Dodge and Romig's work on sampling-inspection procedures provided the foundation for later TQM developments by Juran en Deming.

A heavy impact was made by these early writings on ensuring quality in production. Initially, responsibility was placed on the individual worker or crafts worker for control and inspection. As the industrial period unfolded in the 1920s, 1930s and 1940s, organisations formalised their structures, shifting much of their responsibility for inspection and quality assurance to the supervisor or independent inspector.

Throughout the 1940s and 1950s, the leading firms attempted to institute systematic programs to reduce the number of errors by detecting and eliminating them after they occurred. This defensive character of traditional quality control revolved round the questions: How much expense on quality was tolerable? How much 'quality' was enough? [Garvin, 1987] In 1951, Joseph Juran tackled these questions in the first edition of his *'Quality Control Handbook'*. Juran [1974] observed that quality could be understood in terms of avoidable and unavoidable costs: the former resulted from defects and product failures like scrapped materials or labour hours required for rework, repair, and complaint processing; the latter were associated with prevention, ie inspection, sampling, sorting, and other quality control initiatives.

In 1956, Armand Feigenbaum [1983] took Juran's ideas a step further by proposing 'total quality control' (TQC). Companies would never make high quality products, he argued, if the manufacturing department were forced to pursue quality in isolation. TQC called for 'interfunctional teams' from marketing, engineering, purchasing and manufacturing. These teams would share responsibility for all phases of design and manufacturing and would disband only when they had placed a product in the hands of a satisfied customer - who remained satisfied.

The beginnings of TQM is often attributed to the work of W Edwards Deming ([Smit & Cronjé, 1997]; [Bendell, et al, 1989]; [Holmes, 1992]), who along with Juran assisted Japanese organisations to realise the importance of quality as a manufacturing and marketing tool [Hendry, 1992]. Although his emphasis is on the statistical means of reducing variation in production, Deming's famous *'Fourteen Points of Management'* reflect an equal concern for employees [Deming, 1986], while suggesting a 'systems approach' to quality [Caroselli, 1992].

The spread of TQM is linked to three earlier developments in business, namely the growth of global markets in the 1950s which led to the formation of the European Community, North American Free Trade Area (NAFTA), and the 'Pacific Rim' trading bloc. The growth of this triad-led global economy intensified competition which imposed organisational restructuring and 'downsizing' strategies in the 1980s in attempts to 'add value' by eliminating extraneous costs. Multi-National Companies (MNC)

realised that the pursuit of competitive advantage based on cost alone was ultimately self-defeating, if Western nations had to compete with low-wage economies in the Pacific Rim, China and India which, in the latter two cases, make up over one-third of the world's labour force, with GNPs that are predicted to overtake the GNP of the United States early in the 21st century. This prospect led to the rediscovery of quality as a key factor in differentiating the 'competitive advantage' strategies of MNCs in the triadic global economy in the 1990s [McEwan & Von Solms, 1997]; [Hohner, 1993].

2.2 PROBLEMS IN FORMULATING A TQM MODEL

The peculiarity of the TQM debate is that with all the talk, discussions and claims regarding TQM the subject is more 'fuzzy' than we might expect [Dean & Bowen, 1994] and furthermore, various market forces and attitudes exist that need to be incorporated into any TQM model defined. Three problems are relevant to the discussion:

2.2.1 PROBLEM 1 : PLETHORA OF TQM DEFINITIONS

The first major problem in setting up a model for TQM is that many opinions, systems and models are available, all with their own merits and propagandists. Sullivan [1986b] points out that in the USA quality control and TQM mean different things to different people and much effort is lost in debating the virtues of individual quality programmes. This, he says, paralyses management from acting on quality issues because of little consensus as to what quality control and TQM mean. Stables [1992] lists a number of *current* quality terms and points out that these terms (TQM inter alia) have left many people in such a disarray that they refuse to acknowledge quality as a science. Crawford [1992 : 4] is critical of the various different opinions and in his attempt to define TQM correctly, criticises the various agents that cause the confusion. He says:

"... some recent authors have ascribed different terms to what is, essentially, Total Quality, thus confusing even further managers who are struggling to come to terms with all of the complexity and jargon of this important concept."

A further aspect contributing to the confusion lies in the rival views of the various quality *gurus*. [Dean & Bowen, 1994] Several respected quality experts (Crosby, Deming, Feigenbaum, Ishikawa, Juran and Taguchi, inter alia) have made important contributions to the quality field. Their views are often contradictory, but do also contain complementary elements (cf [Holmes, 1992], [Richrath, 1992] and [Suarez, 1992]).

Holmes [1992] and Richrath [1992] compare the various views and make a synthesis of them rather than follow any one of these gurus exclusively. Burrows [1997] points out that many popular, but erroneous, beliefs exist regarding TQM, creating sizable obstacles to the acceptance of the ideas of the quality gurus.

Finally, many authors on TQM realise the confusion and problems caused by the plethora of terms, definitions and views. They attempt to overcome this problem by presenting their own definitions of TQM (cf Jablonski [1992 : 21] and Crawford [1992 : 5]). This only underlines the necessity for serious consideration of what really is the correct definition of TQM. These new definitions only serve to illustrate the view of Holmes [1992 : 10] that if you ask ten people what TQM is, you will hear ten different answers. In this regard TQM had been variously defined as; a quality improvement process ([Reger, et al, 1994]; [Jablonski, 1992]); a culture change ([Dale & Cooper, 1992]; [Dale & Boaden, 1993]); a new paradigm ([Sentell, 1990]; [Molander & Sisavic, 1994]); a management fad ([Ackoff, 1995]; [Jackson, 1995]) and a management philosophy ([Hohner, 1993]; [Linscheid, 1994]; [Dobbins, 1995]), inter alia.

Clearly, this plethora of definitions and models present a serious problem to the implementation of TQM. If it is not clear exactly what TQM is, any progress towards such a goal is severely hampered. This problem should be confronted and a useful model is needed as the first step towards implementation. A working model will be presented in 2.3 below from the different perspectives found in the literature.

2.2.2 PROBLEM 2 : A LIMITED QUALITY FOCUS EXCLUDING ENVIRONMENTAL ISSUES

A second problem, highlighted by the pressure coming from the environmental field, is that few (if any) of the standard texts on TQM refer to environmental management per se, (cf [Juran, 1974]; [Crosby, 1984]; [Collard, 1989]; [Feigenbaum, 1991] and [Jablonski, 1992]). The effective control and improvement of environmental impacts could implicitly be part of the view that TQM is a total intervention and therefore includes the environment. This is not always clearly stated however and off-the-shelf TQM packages could cause the application of TQM principles on environmental issues to be overlooked.

The historical development of environmental matters, particularly since 1970 (called the "Dawn of the Environmental Era" by Fuggle & Rabie (Ed), [1994 : 18]) was mainly in environmental conferences, legislation and academic activity and not driven by industry.

The attitude of industry, during the 1960s and 1970s, is even likened to 'a state of denial' regarding its impact on the environment [Hart, 1997 : 67]. The foundation for the environmental era was, however, laid earlier in the seminal work of Rachel Carson, who through her books 'The Sea Around Us' (1951) and 'Silent Spring' (1962) challenged the widely accepted notions regarding nature and man. These views offended officials from government and industry. Carson's findings exposed the standard of corporate and bureaucratic indifference and led to the broad environmentalist movement emerging in the 1970s [Peattie, 1992]. The development of environmental concern is reflected mainly in publications of an official nature or through numerous environmental publications [Fuggle & Rabie (Ed), 1994]. Lamprecht [1997] concurs and adds that despite this increased volume of publications, businesses and industries, in general, have been slow or reluctant to respond to the many challenges posed by industrial pollution. Schmidt [1996] emphasises the leading role of legislation pointing out that since the early 1970s environmental policy has relied in 'command-and-control', an approach based on laws and regulations to set standards for air and water quality in contrast to any voluntary self-regulation by industry. Recent emphasis on the importance of environmental management comes mainly from the authors specialising in environmental matters (cf [Cascio (Ed), 1996], [Welford, 1995] and [Lamprecht, 1997]) and the two fields have developed mostly in parallel but separately. A notable exception is found in Oakland & Porter [1995], who, writing from a 'traditional' TQM perspective, link quality management with environmental management.

2.2.3 PROBLEM 3 : ISO STANDARDS NOT INCLUDED

The third problem related to the setting up of a model for TQM involves the ISO 9000 and ISO 14000 standards. The problem seems to involve two separate issues:-

2.2.3.1 RELATIONSHIP BETWEEN TQM AND ISO STANDARDS

Various (diverse) opinions exist as to the merits/demerits of linking TQM and ISO 9000/ISO 14000 activities. These opinions cover both discussions on the practical as well as the philosophical aspects of the themes under review. Examples of varying opinions were listed by Burgess [1993]. Hendry [1992] states that TQM is not achievable without a fully documented quality system and points out that ISO 9000 could provide the framework needed to implement TQM. Crawford [1992] indicates the ISO 9000 documents to form the essential 'systems' part of TQM. Recent references link TQM and ISO 9000 more frequently and favourably ([Oakland & Porter, 1995]; [Carruthers, 1996]; [Kalinosky, 1990] inter alia). The fact that ISO 14000 has only been promulgated in

1997 causes references to these standards, in relation to TQM, to be limited. Oakland & Porter [1995] and McEwan & Von Solms [1997] link ISO 14000 and TQM, while the ISO 9000/ISO 14000 link is frequently made (cf [Cascio (Ed), 1996], [Lamprecht, 1997]).

2.2.3.2 MARKET FORCES RELATED TO THE ISO 9000/14000 STANDARDS

Many companies are well aware of the fact that ISO 9000 certification is essential and that this requirement is a pressure from the market place, with many customers insisting on proof of their suppliers maintaining an ISO 9000 compatible quality system. As early as 1991, David Hutchings International Ltd (DHI) produced a self assessment inventory for TQM stating that British and increasingly other European companies are being compelled to meet the requirements of ISO 9000. It is essential under current market pressures for companies to either maintain ISO 9000 systems as part of their TQM efforts or to maintain these systems independently, the former seems the most logical.

The environmental systems have not yet reached the stage where they are regarded as compulsory but this is sure to happen soon. Van Rensburg [1996 : 27] points out that environmental management is at present one of the most discussed topics and real concerns throughout the world, stating that:

"Environmental management systems may soon be a regulatory requirement for organisations wishing to export to Europe."

Complying with EMS standards, as those embodied by ISO 14000, could soon be a legal requirement in South Africa. Nevell [1995 : 111] stated:

"... industry will have to accept that if it wishes to export it will need to meet international environmental requirements. Hence the opportunity offered by ISO 14000."

This view is supported by an article in the Business Day of 23/08/95 where Val Pienaar reported:

"Consumers in the First World countries with which SA traders are increasingly vociferous in their demands for global environmental accountability."

EIMS [1996] reported that the ISO 14000 standard is set to have profound implications for South African businesses trading internationally. In this report reference is made to the view of a member of the Board of Trade and Industry who stated quite emphatically, that ISO 14001 was going to be written into future multi-lateral trade agreements. In the

light of this it seems inescapable that compliance with ISO 14000 must be a priority effort in the near future and that no quality drive can exclude the incorporation of ISO 14000 into the suite of quality efforts.

2.3 TOWARD A DEFINITION OF A TQM MODEL

Taking cognisance of the problems mentioned, a model of TQM needs to be presented. It should be noted that an exhaustive definition and model is neither possible nor necessary. The principle that continual improvement, an aspect underpinning all TQM efforts, should also be active in the setting up of a TQM system. The TQM system and model itself should be constantly reviewed and changes/ improvements made as and when required. The definition will be constructed from the three aspects represented in the name Total Quality Management.

2.3.1 THE 'TOTALITY' OF TQM

The concern of a limited quality focus with the exclusion of environmental issues, must be addressed in the model of TQM by ensuring that the focus includes all the relevant issues; this implies the need to rethink the 'Totality' aspect of TQM. This is best done by first explicating, what could be called a 'traditional' TQM approach.

2.3.1.1 TRADITIONAL TQM

In the light of the problem identified in 2.2.1 a unique 'traditional' TQM view does not exist. It was argued that the different views and approaches made it difficult to progress towards implementation [Sullivan, 1986b]. Some form of synthesis should be sought and it seems opportune to proceed on two fronts; first, to frame TQM as concept and second, to explicate the central elements found within different TQM approaches.

(i) Framing TQM

Different ways of describing TQM were introduced earlier. One of the ways in which TQM was framed is that of paradigm [Sentell, 1990]. The use of the term paradigm is confusing and for this reason, TQM will not be conceptualised as a paradigm here (cf the discussion on paradigms in 2.4 below). The concept TQM is complex and often the same author alternates between different conceptualisations. Hohner [1993], for instance, refers to TQM alternatively as 'a business philosophy'; 'a mind-set' and 'a

continuous improvement process'. It, therefore, seems appropriate to conceptualise TQM as a **system**, incorporating these different viewpoints of TQM into the single concept of a system which is fully explicated in Chapter 3. For now, it will suffice to indicate that a system is a coherent whole with several interdependent parts (subsystems).

Madu & Kuei [1995 : 163] build on the views of Deming and describe TQM as a system with interdependent parts, including (i) a guiding philosophy; (ii) leadership; (iii) vision; (iv) operating principles; and (v) several quality tools. So, instead of seeing TQM as a philosophy, they define philosophy as a subset of the whole that is TQM. Similarly, Dale & Boaden [1993 : 46] refer to TQM as a *framework*, but the systemic nature is clear. They place organisation, culture, systems, techniques and tools into this framework clearly showing the interrelated nature. This systemic framework approach is also followed by Oakland & Porter [1995 : 31]. Jablonski [1992 : 31] sees TQM as both philosophy and tools that support each other. Spencer [1994 : 446] refers to TQM as a 'comprehensive management practice' that captures signals from various organisation models and provides methodologies for their use. Dean & Bowen [1994 : 395] define TQM as an approach to management that includes *principles*, *practices* and *techniques*, and Bendell, et al [1989] see TQM as a system including philosophy, policies, procedures and tools. Welford [1995 : 54] refers both to TQM as a system, incorporating several related elements and the fact that TQM approaches view the organisation as a system. This 'double' systemic view will be explicated in Chapter 4, below.

TQM is conceptualised as a system, thus TQM is not framed as a philosophy but rather the important philosophical principles are seen as a subsystem of TQM; TQM is not framed as a culture change, but culture change is seen as a essential subsystem of the whole; similarly, TQM is not framed as a set of techniques or tools but rather these methods are part of a coherent whole, interdependent of each other and of the philosophical and cultural subsystems. The framing of TQM in terms of systems can be further enhanced by comparison of TQM with other contemporary approaches.

(a) TQM and Learning Organisations

The view is often expressed that the most successful corporations in the 1990s will be 'learning organisations', or consummately adaptive enterprises. Senge, et al [1994] argue that increasing adaptiveness is only the first stage of moving toward a learning organisation. Instead, they argue that leading organisations are focusing on generative learning, as well as adaptive learning. Adaptive learning, called single loop learning by Argylis & Schon [1978], deals with problem solving without challenging current policies and objectives, while generative learning (double loop learning [Argylis & Schon, 1978]),

on the other hand, requires the re-examination of existing policies and objectives. A learning organisation can thus be seen as an organisation that adopts a learning approach to performance improvement [Ryan, et al, 1997]. Garvin [1993 : 80] defines a learning organisation as:

"... an organisation skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights".

The learning organisation approach is linked to TQM [Ryan, et al, 1997]; [Zavacki, 1997]; [Roos, 1996b]. Similarities between TQM and Learning Organisations are mainly in that both are seen to involve continuous improvement (CI) [Westphal, et al, 1997] via wide participation and empowerment of employees [Ryan, et al, 1997].

TQM is claimed to be less than Learning Organisations on two counts; first, TQM is claimed to involve single loop learning only while Learning Organisations use both single and double loop learning [Ryan, et al, 1997]; second, TQM is claimed not to address systemic aspects adequately, while the Learning Organisations approach better embodies the views of Deming regarding a systems approach [Zavacki, 1997].

(b) TQM and Business Process Re-engineering (BPR)

Business Process Re-engineering (BPR) can be defined as the *fundamental* rethinking and *radical* redesign of business processes to achieve *dramatic* improvement in critical measures of performance such as cost, service and speed [Hammer & Champy, 1994 : 32].

BPR and TQM are linked by Ryan, et al [1997], Hansen [1994] and MacIntosh & Francis [1997]. Although similarities do exist, since both have improvement as goal, and focus on processes, differences are more often discussed. The first significant difference is that TQM is seen as limited to incremental continuous improvement while BPR involves radical change [MacIntosh & Francis, 1997]. TQM is identified with participative management practices while BPR is seen as a more authoritarian top-down approach [Ryan, et al, 1997]. Finally, TQM is normally driven by process management or Quality Control departments while BPR is often IT driven [MacIntosh & Francis, 1997].

BPR and Learning Organisations are also compared as change processes. MacLean & MacIntosh [1997] argue that neither can be considered complete change technologies. They argue that BPR fits the classical school of strategic management in that it is output-focused, design-led and directive, while Learning Organisations fit the 'process'

school of strategic management with emphasis on emergence, human behaviour, cognition and participation.

The simultaneous use of BPR and Learning Organisations is advocated by MacLean & MacIntosh [1997] while the combination of TQM and Learning Organisations is proposed by MacIntosh & Francis [1997]. In both analyses the complementary use of these approaches is seen as fruitful in that the strengths and weaknesses of the different approaches can be utilised to provide a synergistic effect where the strengths of one approach could offset the weaknesses of the other [Ryan, et al, 1997]. The claimed differences amongst the approaches of TQM, Learning Organisations and BPR can, and should, be accommodated within what can be called a systemic TQM approach. In terms of TQM and Learning Organisations, Sitken, et al [1994] argue that TQM should include both *control* (single loop learning) and *learning* (double loop), while Dobbins [1995] argues for learning as a *subset* of TQM. In terms of TQM and BPR, Long & Vickers-Kogh [1995] argue against 'one best form of TQM' and advocate using both continuous improvement and BPR as part of TQM, while Thompson & Strickland [1995] also suggest the use of TQM and BPR in tandem. In such a systemic TQM model, TQM is seen as the unifying corpus in which the different change and learning strategies are integrated.

(ii) Elements of TQM

Which elements should be included into a model of 'traditional' TQM? The reference here called 'traditional TQM' refers to the fact that although differences in TQM approaches exist, several recurring aspects or elements are found in the TQM literature. A survey of a wide variety of TQM approaches [Caroselli, 1993]; [Collard, 1989]; [Crosby, 1984]; [Dale & Plunkett, 1990]; [Deming, 1986]; [Dewar, 1992]; [Domb, 1993]; [Feigenbaum, 1983]; [Flood, 1993]; [Hendry, 1992]; [Holmes, 1992]; [Jablonski, 1992]; [Juran, 1974]; [Kelly, 1994]; [Mizuno, 1988]; [Oakland & Porter, 1995]; [Richrath, 1992]; [Ross, 1993] and [Sullivan, 1986] identified 13 elements that appear generally (traditionally) in TQM models. These elements are listed in Table 2.1.

The definition of TQM as quoted by Jonker & Klaver [1997a : 63]:

"TQM is ... a way of doing ... An all encompassing quality focused approach which creates and gains its advantage from asynergy among all aspects of the organisation working together to achieve excellence... An approach which creates value for customers, employees, stockholders, owners and the community, and which ultimately leads to a realisation that products and services are the expression of human excellence."

is typical of the 'traditional' approaches, and aligns the whole organisation behind the quest for quality in products and services. This important aspect of the 'Totality' of TQM must be retained in any model of TQM.

Table 2.1 - TQM Principles and ISO 9000 Compatibility

	TQM Principles	Directly Compatible	Indirectly Compatible
(1)	Top Management Commitment/Drive	*	
(2)	All areas/People involvement		*
(3)	Teamwork		*
(4)	Training	*	
(5)	Improved Communications	*	
(6)	Creativity & Freedom		*
(7)	Customer Focus	*	
(8)	Quality System	*	
(9)	Cost of Quality	*	
(10)	Fact Based Decisions	*	
(11)	Continuous Improvement		*
(12)	Prevention instead of Inspection	*	
(13)	All work a process	*	

2.3.1.2 BEYOND 'TRADITIONAL' TQM

The importance for organisations to be seen as 'environmentally friendly' by their customers is perceived as extending competitive advantage and hence the interest in ISO 14000 certification from a strategic management standpoint. The increased pressure from various sides on companies to pay more serious attention to environmental management has been pointed out in 2.1.3.2 above, aligning the whole organisation behind sound environmental performance, as for quality, clearly points to a TEM (Total Environmental Management) approach [Welford, 1995]. The logic of combining these two important aspects of management seems obvious [Lamprecht, 1997]. Oakland & Porter [1995] emphasize the importance of environmental management within a TQM framework and link both ISO 9000 and BS 7750 (ISO 14000) to an integrated system to achieve this. Carruthers [1996] challenges the wisdom of managing for quality, safety, health and environmental acceptability in a piecemeal fashion. He suggests the integration of all these managerial responsibilities into a single activity based on an

adapted ISO 9000 format. Integration of different management systems, especially systems for quality management and environmental management seems a topical item internationally. Klaver & Jonker [1997a] refer to a recent survey of Dutch companies indicating that 55 % of the 175 firms either already use integrated systems or are in the process of integration. It follows from this short discussion that the width of TQM should be defined by explicitly including environmental management into the TQM view.

2.3.1.3 THE 'TOTALITY' OF TQM : SUMMARY

The **'Totality'** of TQM should be defined in terms of both depth and width:-

(i) *Depth* - the alignment of the whole organisation, all processes and every employee behind the search for excellence in everything being done. This could be identified with the 'traditional' TQM approach.

(ii) *Width* - the expansion of the 'traditional' TQM view to include both effective quality and environmental management.

2.3.2 THE QUALITY ASPECTS OF TQM

The discussion here is not directed at the product, service or environmental quality aspects but rather at the quality of the TQM process per sé.

TQM was shown to be a nebulous concept (2.2.1 above) and progress along a TQM route may be difficult to evaluate without clear constructs and milestones. A measure of the *quality* of a TQM approach should be defined to assist in guiding the progress. Simultaneously, the third concern discussed in 2.2.3 above, ie that of the exclusion of ISO 9000/14000 standards from most TQM approaches, is addressed. A 'compliance to specifications' definition of quality is used [Reeves & Bednar, 1994] implying that if specific requirements for the TQM process are defined, the level of TQM achievement can be measured. The ISO 9000/14000 standards fit this bill well. Hendry [1992 : 28] argues that the application of TQM suffers due to the lack of clearly defined 'specifications', but that the use of ISO 9000 could remedy this. The ISO standards are known and used internationally, many organisations would not want to relinquish their ISO 9000 systems and are seriously considering ISO 14000. Redefining TQM in terms of these standards would, therefore, be advantageous.

The three main advantages include:-

- A positive image for the company, with greater credibility and acceptance [Flood, 1993 : 68].

- Standards against which a company can measure its own progress and compliance in terms of both quality and environmental management [Murphy, 1995 : 98].

- A common framework against which an organisation's ,commitment to, and implementation of quality and environmental management can be gauged by customers and external stakeholders [Ferguson, 1995 : 65]; [Green & LaFontaine, 1996 : 42].

2.3.2.1 ISO 9000/TQM SYNTHESIS

Once it has been accepted that the most convenient way of introducing a TQM approach would be to define TQM in terms of ISO 9000, a very important question must be answered: Can this be done? It might well be the most cost-effective and (theoretically) logical solution, but if the two approaches are totally different and no synthesis can be made, the whole argument in favour of such a model falls away. It is, therefore, important to compare the two approaches to determine whether a workable synthesis can be achieved. The 13 principles, found generally in TQM approaches (Table 2.1), can be compared to ISO 9000. From this two perspectives follow:

(i) Principles Directly Compatible

Several of the 13 TQM principles under review are directly compatible with the ISO 9000 standards, as shown in Table 2.1 in Column 3. For these TQM principles, the same emphasis appears, either as a requirement for certification against the certification standards, ISO 9001 and ISO 9002, or as a recommendation in the guidelines of ISO 9004. Organisations using ISO 9000 based systems would, therefore, comply with many of these aspects by virtue of their being a requirement. Many would also include aspects, as for example Cost of Quality, which although not an ISO 9001 requirement, is clearly given prominence in ISO 9004-1 § 6, in an attempt to progress beyond the minimum requirements.

The direct compatibility can be shown as follows:-

(1) Top Management Commitment/Drive

The fact that ISO 9000 is called a Quality *Management* System Standard, already suggests that the drive must come from management. The Standard itself puts this beyond argument. In ISO 9002 § 4.1 the (mandatory) responsibility of management is defined and includes, the Quality policy and its implementation (§ 4.1.1), allocation of adequate human and technical resources (§ 4.1.2), review and evaluation of the effectiveness of the system (§ 4.1.3). Systems experts confirm that a quality system must be led from the top (cf [Shepherd, 1996] and [Richrath, 1995]). Both TQM and ISO 9000 rely on the active involvement and drive by top management [Hendry, 1992].

(4) Training

Training forms a very important aspect of the ISO 9000 standards. The identification of training needs, the provision of adequate training and the maintaining of training records are mandatory requirements as documented in ISO 9002 § 4.18. No difference exists between TQM and ISO 9000 approaches in terms of the emphasis on adequate training and education [Hendry, 1992].

(5) Improved Communications

Communication is not addressed as such in the ISO 9000 standards. No particular element of ISO 9002 explicitly promotes communication. This does not imply, however, that improving communications is against the spirit of the Standards, on the contrary, the formal documented system is in itself a written communication of company policies, procedures, standards and goals. A clear communication of every employee's role and responsibilities and management's commitment to quality. Seen this way it is clear that effective communication is in line with the spirit of the ISO 9000 standards, as it is within TQM. Effective communication is, like all the other aspects of TQM discussed here, a rich and complicated subject and an exhaustive discussion falls outside the focus of this chapter. For now it will suffice to indicate a few caveats raised by McEwan [1995]. First, that because of its all-pervasive, complex nature, communication has, until recently, been ignored by writers on organisational behaviour. Second, older communication models often fail to integrate the social aspects of communications with the legitimate goals of, for example, the owners and managers of organisations. The open systems perspective addresses this difficulty [McEwan, 1995 : 373]. Third, job satisfaction and job quality are related to the form of communication experienced by employees. Lastly, McEwan [1995 : 351] points out that any analysis of communication in organisations must remain incomplete unless it deals with both the formal and the

informal aspects of the phenomenon. This point is directly relevant tot the current discussion, because ISO 9000 represents the 'formal' aspect of communication but leaves the informal aspects untouched, a problem that needs careful consideration in any TQM system based on ISO 9000.

(7) Customer Focus

The importance of a customer focus is a central theme in the ISO 9000 standards. This can be seen by looking at the guidelines given in ISO 9004; A company must offer products or services that 'satisfy customer expectations' (§ 0.1); , Organisational goals should be set 'to satisfy customer expectations' (§ 0.2); 'Customer needs must be met' (§ 0.3) and the system must give assurance that this happens (§ 4.4.4); and, finally, ways must be defined to 'determine and define customer needs and expectations' (§ 5.1.2). TQM and ISO 9000 clearly agree on this point.

(8) Quality System

The use of ISO 9000 as the quality system component of TQM will be argued below, when it will be posited that ISO 9000 is an adequate system on which to base TQM.

(9) Cost of Quality

Quality Costing is not a requirement of ISO 9000 standards and, in fact, most certified systems do not include this aspect. The costing of quality is however included in ISO 9004, first as a general guideline for quality systems (§ 0.4.3) and then more completely in § 6. This paragraph starts off with a general introduction and motivation: "The impact of quality upon the profit-and-loss statement can be highly significant, particularly in the long term. It is, therefore, important that the effectiveness of a quality system be measured in a business-like manner. The main objective of quality cost reporting is to provide means for evaluating effectiveness and establishing the basis for internal improvement programme." The remainder of the discussion includes a reference to the elements of quality costs (in which the same general categories a those advocated by BS 6143 are used) and some practical application criteria.

Although Quality Costing is not a requirement of the application standards, its inclusion in the guidelines of ISO 9004 clearly indicate that the inclusion of such a costing system is desirable and fully compatible with the ISO 9000 approach.

(10) Fact-Based Decisions

The 'fact-based' approach is self-evident in the ISO 9000 standards. The standards abound with references to techniques and statistics and particularly to the use of quality records to prove compliance to requirements, both of product specifications and of the standards themselves. In the training of both internal and external auditors the search for *objective evidence* is stressed. This should normally be in the form of documentation, records or results, ie fact-based information. The standards themselves give ample evidence of the need to measure, record and verify processes, products and services against laid down specifications. Two mandatory requirements relate to factual data-based decision making, they are § 4.10 - Testing and Inspection and § 4.20 - Statistical Techniques.

Clearly no problem exists in this area. Both TQM advocates and the ISO 9000 standards agree that fact-based decisions and actions are of paramount importance.

(12) Prevention Instead of Inspection

The element of prevention rather than inspection forms part of the ISO 9000 approach. This is clear from various aspects raised in ISO 9004; The principle is stated in § 4.4.4(c); prevention of non-conformities are advocated in § 14.7 and § 15.6; 'Front-end' activities are included into the Quality Loop (§ 5.1.1). The certification standards (ISO 9001 and 9002) agree with a move from Inspection (§ 4.10) forward to include prevention in the form of Process Control (§ 4.9), goes beyond that to Procurement (§ 4.6) and, in the case of ISO 9001 § 4.4, to design. The ISO standards, like TQM, place emphasis on prevention.

(13) All Work a Process

The ISO 9000 standards set guidelines for supplier/producer/customer chains by defining requirements for procurement (suppliers), process control (producer) and delivery (customers). The 'size' of the organisation is not specified. Normally an organisation will use the whole plant as the 'unit' and set up their system with *external* suppliers and *external* customers at both ends and the complete process in between. There is, however, no reason why different departments could not be seen as the 'unit' and a full ISO 9000 system documented for that department referencing their *internal* suppliers and customers.

The principle of internal and external supplier/customer chains is not different if viewed from a TQM or an ISO 9000 perspective.

(ii) Principles Indirectly Compatible

Table 2.1 marks the 4 principles not directly compatible with ISO 9000 in Column 4. The 'indirectly compatible' implies that these principles are neither a standard requirement nor is it discussed in ISO 9004 as a recommendation. The compatibility flows, however, from 2 principles embodied in the ISO 9000 standards:-

(a) ISO 9000 As Generic Standards

The ISO 9000 standards are generic and, as far as possible, avoid specific references. This makes the standards very flexible in their application. This flexibility was incorporated to serve various industries, organisational sizes, etc, but as a fringe benefit the flexibility now serves the incorporation of TQM by not limiting the approach in any way. The generic and flexible nature of the ISO 9000 approach opens the avenue to incorporation of TQM elements even if they do not appear as such in the ISO 9000 standard requirements. In this regard Flood's comment [1993 : 54] that the standards are flexible enough to accommodate various management styles and theories is relevant.

(b) ISO 9000 As Minimum Standards

The ISO 9000 standards set minimum requirements and do not limit the expansion of the system by setting 'upper' limits above which expansion would violate the standards. This approach opens the avenue for incorporation of TQM elements because expansion *above and beyond* the standard requirements are not only allowed but is in actual fact encouraged. In the light of these two principles the aspects of TQM marked as 'indirectly compatible' (Table 2.1, Column 4) can be related to ISO 9000 as follows:-

(2) All People/Areas Involved

The ISO 9000 standards refer repeatedly to 'work or activities affecting quality' and the employees who can 'affect quality', and thus limit the application of ISO 9000 to 'quality related' areas and people, in contrast to TQM. The principle of ISO 9000 as *minimum* standards allows the expansion of an ISO 9000 system to include every employee. The requirements of the standard is exceeded without contravening any of its principles and in line with the spirit of ISO 9004 § 183.2.

(3) Teamwork

When the principle of teamwork is viewed from the perspective of ISO 9000 it must be stated that these standards do not specifically promote teamwork. This does not mean that the use of teams is incompatible with the spirit of the standards. The principles are not actively propagated, but ISO 9004 § 18.3.4 refers to measuring quality and states that this can be done based on the quality achievements of either individuals or groups. The group (team) effort in quality achievement is clearly recognised and could be included into an ISO 9000 system as part of a TQM programme.

(6) Creativity/Freedom

The aspects of creativity and freedom are not addressed within the ISO 9000 standards. The standards assume that the quality standards are known and that products and services can be measured against these set criteria. The notion of *new* in the sense of 'without known specifications' is foreign to these standards. This is clear from the definition of quality given in ISO 8402: "Quality - The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs". The standards view quality as relative to an *existing* need, either expressed or implied, future needs are excluded. It would seem that in this regard TQM and ISO 9000 are totally different. It must, however, be remembered that within TQM certain notions, like 'quality is conformance to requirements', 'zero defects' and 'do it right the first time' [Crosby, 1984] can be construed to stifle creativity and innovation [De Wet, 1989]; [Crawford, 1992]. Within the TQM domain this conflict is resolved by defining, as Juran [1986] does, that two processes exist simultaneously within TQM, quality control and quality enhancement. The former is predicated on maintaining set requirements and it is here that ISO 9000 is ideally suited. The latter process of quality improvement could be introduced in parallel with the quality control aspects of ISO 9000.

(11) Continuous Improvement

Although continuous improvement is not specified as a requirement in the ISO 9000 standards, the goal of improvement is stated in ISO 9004 § 5.5 where the changing needs of customers are used to motivate constant review and updating of specifications, methods and procedures. The argument regarding creativity and innovation, above, is relevant here and interestingly ISO 9004 § 10.1.5 advocate the improvement of processes along with the maintenance of standards. So, although ISO 9000 is primarily geared towards the control of quality, the *minimum* character of this approach allows the

incorporation of specific improvement aspects. It is, in fact, argued that companies who are either ISO 9000 certified or conscious are better at applying continuous improvement programmes [He, et al, 1996]. This view stresses that, although ISO 9000 emphasises quality *control*, it also forms a good platform for quality *improvement*.

These 4 principles can be shown to be compatible with a view, of what could be called, an 'expanded ISO 9000' system [Kalinosky, 1990 : 52]; [Dale & Boaden, 1993 : 48]. None of these principles are such that irreconcilable differences would necessitate abandoning the ISO 9000 standards as the basis of developing a system towards TQM.

(c) ISO 9000 As Adequate Standards

From the summaries in (a) and (b) above, the conclusion can be drawn that ISO 9000 forms an adequate framework on which to base TQM initiatives. The generic and minimum characteristics of the ISO 9000 standards, coupled with the total systems approach underlying their establishment, make these standards the ideal model for TQM and the ideal vehicle for many organisations to use on their road to excellence.

This adequacy of ISO 9000 is argued by various authors, inter alia Hendry [1992 : 29], Holmes [1992 : 89-106] and Kelly [1994 : 247-267]. Kelly & Elridge [1994 : 65] call ISO 9002 the 'cornerstone for continuous improvement', while Kalinosky [1990] presents a framework for TQM based on ISO 9000. Interestingly, he refers to both the principles (a) and (b) above when he says [1990 : 50]:

"The ISO 9000 series is applicable to such a wide range of industries because it was written generically ... The ISO 9000 series must be looked at as a series of minimum quality system requirements."

Carruthers [1996] not only emphasises the need for a holistic approach to quality, but specifically argues for the use of ISO 9001 as the basis of such approach. He quotes a case as follows [1996 : 55]:

"They developed an integrated management system and manual that covered all of these issues using ISO 9001 as a common denominator and adding a further seven subjects to cover the rest."

TQM systems based on ISO 9000 are also advocated by Oakland & Porter [1995]; and Steenkamp [1995]. There are also dissenting voices and it would not be honest to ignore the criticisms levelled at ISO 9000. These criticisms will be discussed in 2.3.2.3 below.

In summary: It is contented that ISO 9000 forms an *adequate* documentation framework to base TQM implementation on and, given the *minimum* requirement strategy, does not limit the extension of the system to encompass each and every area deemed appropriate to a Total Quality approach.

2.3.2.2 ISO 14000/TQM SYNTHESIS

When looking for a synthesis between TQM and ISO 14000 Environmental Management Standards the discussion will assume equivalence between TQM and ISO 9000 (2.3.2.1 above) and proceed to compare ISO 14000 with ISO 9000. The drafting of the ISO 14000 family of standards developed along the same lines as that of ISO 9000 and compatibility was sought from the start. The working and structure of ISO 9002 and that of ISO 14001 are so similar that a synthesis seems not only easy, but in fact 'demanded' by the similarities. Van Rensburg [1994 : 13] calls ISO 14001, 'the counterpart of ISO 9002', while Vander Linden [1997 : 27] indicates that ISO 14001 is 'your basic ISO 9001 document in disguise'.

Two aspects need to be clarified, however, before such a synthesis is made:-

(i) The Difference In Focus Between ISO 9000 And ISO 14000

ISO 9000 (TQM) focuses on Quality Management while ISO 14000 focuses on Environmental Management, this difference in focus should be reviewed. The fact that ISO 14000 has a different focus from ISO 9000 is self-evident and it is not at all surprising to hear comments like that of Webb [1995 : 37], pointing out that the different standards share common elements but that each has a very different focus, and Bird warning [1995 : 95] that the differences between ISO 9000 and 14000 must also be noted when comparing the two standards. What are these differences, and how do they influence the attempt to synthesise ISO 9000 and ISO 14000 approaches? The differences are in both customers and costs:-

(a) The Customer

From an external viewpoint, ISO 9000 can be credited with improving the quality and accountability of exchanges between contracting parties, ie between a firm and its suppliers; or between a firm and its customers. ISO 14000 improvements are often seen as more nebulous, since the programme seeks to manage an organisation's relationship to its neighbours, and to ecosystems in general. This view involves, not only the differences in the 'customers' of ISO 9000 and of ISO 14000 but, very importantly, also

the differences in perceptions of these 'customers' held by industry. If the customer (in the normal sense of the word) is often seen as a 'bloody nuisance' [Peters, 1982 : 156] the 'green types' or 'greenies' are viewed with even more negative attitudes.

The different views of the 'customer' is in itself the actual problem. By creating a dichotomy as far as *quality*-customers vs *environmental*-customers, a fundamental error is made. The 'quality' and 'environmental' customer is in many cases the same customer. More and more, customers are demanding environmental characteristics, of both products and the processes of their manufacture, as an integral part of the overall quality. It is clear that any environmental feature desired by the customer forms part of **quality** when the definition of quality, given by ISO 8402 - 1986, and that given by the Japanese (JIS Z8101 - 1981) are used. In both cases environmental aspects are explicitly listed as part of the 'totality of features' that make up quality. The term quality then clearly includes environmental features making a split between quality customers and environmental customers impossible.

Correcting this erroneous view, not only makes the synthesis between ISO 9000 and ISO 14000 possible, but in actual fact *demands* it. Not only should both quality and environmental approaches be applied, but importantly - they should be integrated. The effort should be a total quality approach addressing both aspects in a single, integrated system, ensuring that the 'totality of features' is achieved in a co-ordinated way. This is an essential principle of the 'Winter Model', developed by Georg Winter, and implies that a product is of high quality only if is manufactured in an environmentally benign way and if it can be used and disposed of without causing environmental damage [Winter, 1995 : 29]. Thus the Winter model stresses the use of traditional management tools for ecological purposes and issues of quality are an integral part of this approach [Welford, 1995 : 80].

(b) The Costs

Internally, many view procedural or technical steps required to improve overall quality as having the potential to impact on the bottom line, while environmental improvements are often seen inappropriately as a cost centre, with no direct impact on the bottom line. The cost saving and profit improvement potential of quality efforts are compared to cost increases caused by any environmental efforts.

The view that quality efforts can reduce cost, increase profits and market share but that environmental practices only increase cost is almost certainly wrong. The important feature of business is not only short-term gain but also long-term viability and growth.

The drive to expand the business goal to include both economic and ecological aspects is embodied in the concept of sustainable development which stresses the interdependence between economic growth and environmental quality [Welford, 1997 : 2] and the element of futurity; requiring the firm to have a long-term planning horizon and to challenge the short-termism so often criticised in business [Welford, 1997 : 18]. It must be clear that not addressing environmental features demanded by customers (either in the products or processes), disregarding pressures from environmental lobby groups and contravening regulatory requirements could lead to financial problems. On the other hand it is argued that environmental opportunities may actually become a major source of revenue growth [Hart, 1997 : 68] and environmentally pro-active companies can reap significant financial gains [Lamprecht, 1997 : 97].

A feature of sound environmental management, is responsible resource utilisation. Without proper resource management the long-term future of any company is bleak. Furthermore, along with proper resource management, the Environmental Management Systems (ISO 14000 included) demand attempts to decrease energy use and waste production. Efforts to achieve these goals should increase profitability, [Winter, 1995] and [Hart, 1997]. Loughran & Caldwell [1997 : 90] give, as benefits of energy and water saving, both environmental benefits and financial savings [McEwan, et al, 1998].

(ii) The Difference In Structure Between ISO 9000 And ISO 14000

In spite of the similarities between these two ISO standards, some differences do exist. These differences will now be reviewed and a practical synthesis established. When the actual structures of the ISO 9002 and ISO 14001 standards are compared three distinct scenarios are apparent:-

(a) Equivalent Elements

Most aspects of ISO 14001 have direct equivalents in ISO 9002 and pose no problem to integration. Documents of an existing ISO 9002 system can in such cases be used *as is* to comply with both ISO 9002 and ISO 14001. References to *quality* might have to be expanded to explicitly include environmental aspects. Examples are showed in **Table 2.2** and such documents are indicated as applicable to both standards by indicating both standards' clauses.

(b) ISO 9002 Only

Some elements of ISO 9002 do not have equivalent elements in ISO 14001. These are elements of an unique 'quality' nature. A good example is Contract Review (ISO 9002 § 4.3). Because no contractual agreement is relevant to ISO 14001 no such element exists in this standard. These procedures, complying to ISO 9002 need no changes and should remain in the new combined system as they existed in the single ISO 9002 system. These procedures are indicated in **Table 2.2** as *ISO 9002* only by listing only the ISO 9002 clauses.

(c) ISO 14001 Only

Some elements of environmental management do not have equivalents in ISO 9002. These procedures are indicated as *ISO 14001 Only* in **Table 2.2** by listing the ISO 14001 clauses.

Table 2.2 - Structure Comparison - ISO 9002 & ISO 14001

Requirement	ISO 9002 Clause	ISO 14001 Clause
Organisation	4.1.2	4.3.1
Document and Data Control	4.5	4.3.5
Internal Audits	4.17	4.4.4
Management Review	4.1.3	4.5
Contract Review	4.3	-
Product Identification and Traceability	4.8	-
Environmental Aspects	-	4.2.1
Legal Requirements	-	4.2.2
Environmental Communication	-	4.3.3
Emergency Preparedness & Response	-	4.3.7

A similar table showing all the links between ISO 9001 and BS 7750 (ISO 14001) is given by Oakland & Porter [1995 : 111].

(iii) The Synthesis Between ISO 9000 And ISO 14000

The different focus and structure of ISO 9000 and ISO 14000 should not be used to try and prevent a synthesis. On the contrary, the dichotomy created is wrong and must be discarded. In its place a holistic, systemic approach should be followed in which full integration of quality (ISO 9000) and environmental (ISO 14000) management is achieved. Winter [1995 : 33] stresses the integration of environmental management with other management functions and refers to the 16 principles set up by the International Chamber of Commerce for Environmental management. The second of these principles stresses the full integration of environmental policies, programmes and practices into each business as an essential element of management in all its functions. Several other authors stress these links, and the need of integration, between quality and environmental management. These include Green & LaFontaine [1996 : 44] who show that environmental management is but one aspect of a single management system; Cascio (Ed) [1996 : 99], Lamprecht [1997 : 74], Bird [1995 : 95], Petrini [1997 : 19] and Van Rensburg [1996 : 28] who indicate that integration will reduce redundancy, by eliminating duplication in systems development, and thus result in cost and time savings; Oakland & Porter [1995 : 112], Zuckerman [1996 : 133] and Klaver & Jonker [1997a : 72] argue that the integration of these standards will result in more effective coordination and control in essential aspects of quality and environmental management. Welford & Prescott [1994 : 240] indicate several similarities between TQM and sound environmental management principles and argue for linking TQM and EMS.

In summary: The paramount importance of Environmental Management Systems should be recognised by all organisations. Such an EMS should be *fully integrated* with the traditional Quality Management System to ensure a balanced, co-ordinated effort in Total Quality (Product-, Process- and Environment) Management. In short, using an integrated ISO 9000/14000 system is the best practical framework for building a TQM system.

2.3.2.3 CRITIQUE OF THE TQM/ISO SYNTHESIS

The conclusion reached above, that ISO 9000/14000 systems should form the basis of TQM is one side of the argument. Dissenting voices are also heard and it would be wrong not to mention the criticisms levelled at ISO 9000. Crawford [1992] refers to 'systems' as one of the four elements of Total Quality and lists ISO 9000 as such a

system. He is, however, very negative and against the ISO 9000 standards and approach in a later article [1993]. The criticisms expressed by Crawford, are echoed by respondents quoted by Ferguson [1995 : 65], and are mainly of two kinds:-

(i) ISO 9000 does not go far enough or encompass the whole area that should be addressed for TQM; and (ii) ISO 9000 does not necessarily lead to better products.

These issues are briefly discussed below:-

(i) ISO Standards Limit Growth To TQM

The argument basically states that certain (important) aspects of TQM is not included into the ISO 9000/14000 requirements. Crawford [1993 : 15] calls ISO 9000:

"... positively pedestrian when compared with both the Japanese Deming Award and the American Baldrige Award."

Crawford argues that the ISO 9000 requirements amount, at best, to 300 of the 1000 points of the Baldrige scheme. This, in Crawford's view, makes ISO 9000 inappropriate as a model for TQM. This view cannot be accepted, however, because the issues highlighted as not included in the ISO 9000/14000 regime, normally include the principles indicated as 'Indirectly compatible' (Table 2.1 above) and this has already been shown as not an insurmountable problem.

A particular aspect of the criticism should be accepted. The 'traditional' ISO 9000 implementation often is to the 'letter of the law', ie complies only with the requirements of the standards, but does not go beyond to fulfil the spirit of the standards. 'Softer', non technical issues can, and often are, overlooked. As an example Kalinosky [1990] refers to the fact that ISO 9000 applications often ignore human resource management aspects, while only addressing training because the latter is an ISO 9000 requirement (§ 4.18) while the former is not. That such issues could be excluded, will be discussed below.

(ii) Improvement Not Assured

The argument that ISO 9000 does not necessarily lead to better quality is clear from the following quotation by Ferguson [1995 : 65]:

"ISO 9000 is only one part of a quality system. It does not come close to addressing whether the customer's needs are being met. A concrete life vest manufacturer could be ISO 9000 certified."

A similar 'static' view of the ISO standards is expressed by Dale & Cooper [1992] and Klaver & Jonker [1997b]. The argument expressed in Ferguson's quote is valid but impracticable. ISO 9000 certification alone is not adequate to be a good supplier. Customers will not buy unusable/bad products. Clearly, the ISO 9000 approach - as does TQM - assumes that the organisation is viable at present, producing sensible and practical products and tries to formalise the operations to provide consistency and a platform for improvement.

The ISO 9000 approach is often seen as enshrining a *status quo* attitude. This error can easily be made and it is not difficult to understand why. The standards are dominated by words like *maintain, control,* etc. carrying the connotation of a static system. This view of the standards is wrong on two counts. First, customer needs and market demands change continually - to meet these requirements, specifications and operations must be updated. This dynamic view is represented by ISO 9004-1; first in the guidelines for review and evaluation of the quality system (§ 5.5) and second, improving processes along with maintaining standards are advocated directly by § 5.6.

The danger of seeing ISO 9000 or ISO 14000 certification as the goal and not progressing 'beyond' the certification point towards improvement is often mentioned as one of the flaws of using these standards as the core of any TQM programme [Crawford, 1993]. Progress 'beyond' the minimum requirements of the standards must be actively sought for both ISO 9000 [Dale & Cooper, 1992]; [Ferguson, 1995] and for ISO 14000 [Welford, 1995]; [Petrini, 1997]; [Sunderland & Thomas, 1997].

total quality management.

2.3.3 THE MANAGEMENT OF TQM

To address the concerns expressed above two very important principles must be included in the way in which TQM is implemented and managed.

2.3.3.1 INTEGRATION

Viewing TQM as the single system in which the different improvement interventions are unified, demands a management philosophy of integration, or a systems approach (cf [Badiru, 1990] and [Deming, 1989]). The principle of integration must be applied both to the **'width'** of TQM by integration of the quality and environmental management systems, and the **'depth'** of TQM by integrating the 'soft' human issues with the traditional (hard) ISO 9000/14000 standards' requirements.

The integration philosophy implies a 'whole systems' view particularly guarding against sub-optimization (cf [Dettmer, 1995]; [Heilmann, 1994]; [Feigenbaum, 1983] and [Caroselli, 1993]). Roth [1991 : 67] points out that the systems approach runs contrary to the more familiar 'analytical thinking' approach. Traditional analytical logic requires that a problem/machine be broken down into smaller parts and that each part be individually analysed. This approach, he says, is more effective in technical problem-solving but when the human element is added, however, the analytical approach runs into trouble. Quality improvement efforts will often be less effective because:

"They suffer from the same corporate stress on analysis that every other function suffers from. As a result, excellent quality improvement pieces have been developed, but the whole - necessary for long-term success - is lacking."

Quality objectives must be prioritised, integrated and applied uniformly throughout the organisation with a global systems objective. The aspect of the integration of quality and environmental management systems was discussed in 2.3.1.2. above. The aspect of addressing the 'depth' of TQM was discussed under 2.3.1.1 above, indicating that this growth 'beyond' ISO 9000/14000 must be actively promoted. The aspect of a systemic approach to integration will be returned to, after the discussion, of what such a systems view entails, has been done (Chapter 3, below).

2.3.3.2 PARTICIPATION

Encouraging the widest degree of participation and empowerment of employees is one of the universal principles underpinning TQM approaches (cf [Feigenbaum, 1983]; [Dewar, 1992]; [Jaehn, 1989]; [Kelly, 1994] inter alia) and is summarised by Labovitz, et al [1992 : 176], calling 'Total Involvement' one of the five 'pillars' of quality. In the case of environmental management, participation and empowerment are expanded to include all stakeholders, be they inside or outside of the organisation [Welford, 1997].

Real participation from every employee may not be achieved by the traditional ISO 9000/14000 systems only [Flood, 1993]. Real participation, is argued, can only be realised within a culture that embodies the values of empowerment, commitment and teamwork to improve quality ([Mead, 1985]; [O'Reilly, 1989]; [Dale & Boaden, 1993]; [Eckes, 1994]; [Schein, 1994]), and to achieve effective environmental management [Welford & Prescott, 1994]. Participation must not only be limited to participating **in** the system, but include participating in the **design** of the TQM system. Without real

involvement, commitment to TQM will not be forthcoming ([Twesme, 1991]; [Robinson, 1996]). An organisation must design and implement its own TQM system, adapting it to the unique circumstances of the organisation ([Powell, 1995]; [Collard, 1989]; [Slack et al, 1995]; [Dale & Cooper, 1992]; [Loeckenhoff, 1994]) and in this process involve the widest range of stakeholders possible. The use of TQM 'packages' is seen as problematic [Sitken, et al, 1994].

The participation principle is, however, not without problems and these need some consideration. Employee involvement (EI), as a process for empowering members of organisations to make decisions and solve problems appropriate to their levels in the organisation, is seen by most TQM authorities as a necessary ingredient for overall organisational effectiveness. The potential conflict between TQM and EI and the need for integration have been noticed by Pace [1989]. Two reasons for this possible conflict are given; first, EI is philosophically oriented toward the increase in commitment, via a *reduction* in management control, while TQM is usually implicitly or explicitly oriented toward an *increase* in management control; second, EI means living with creative solutions and the resultant variety of approaches, while TQM strives for standardisation of work processes and outputs [Lawler, 1994]. Pace [1989 : 110] argues that the simultaneous implementation of these processes, without proper integration and coordination, could lead to the two approaches working at cross purposes.

Dean & Bowen [1994] indicate that involvement and empowerment approaches in TQM are similar to Likert's [1961] System 4 Organisations [Robbins, 1989 : 537] and McGregor's [1960] Theory Y [Robbins, 1989 : 151] which assume employees are motivated and capable of doing good work on their own. The management theory literature sometimes presents the involvement and teamwork practices within a contingency perspective, in contrast to the universalistic prescriptions of TQM [Dean & Bowen, 1994 : 401]. According to this view, the effectiveness of involvement and empowerment strategies have been presented as contingent upon such factors as business strategy, the relationship with customers, technology and environment. Examples of such contingency approaches can be found in the work of Burns and Stalker [Burns, 1963], relating management style to environmental factors [Mullins, 1996 : 379] and the Leader-Participation Model of Vroom and Yetton [Vroom, 1974], relating the degree of participative decision making to the different decision situations [Robbins, 1983 : 321]. Dean & Bowen [1994 : 401] point out that related research has not promised universal performance returns from participative decision making [Nystrom, 1978], as TQM proponents tend to imply.

A final aspect to the participation debate relates to the paradigm within which the participative culture is located. The danger that the dominant functionalist paradigm may inhibit participation is stressed by Jonker & Klaver [1997a : 66] when they argue that the way in which TQM traditionally approach organisational change is 'naive' and based on an 'analytical and instrumental past'. They seem to argue for a more interpretive approach, although this is not explicitly mentioned. Other authors refer to the interpretive/participative link directly (cf [Flood & Jackson, 1991]; [Cantrell, 1990]; [Roos, 1996a]). A different, and radical, point of view is that of Boje [Dean & Bowen, 1994] and other critical theorists [Cascadden, 1997b] in which TQM is seen as really a modern repackaging of Taylorism [Spencer, 1994]. According to this view employee participation is said to be a masquerade for getting workers to 'self-Taylorise' their own jobs, and that teams (or culture [Cascadden, 1997b]) are really a source of tighter, more oppressive control than hierarchy. Conti's [1995 : 44] view is less extreme but does point to the 'legacy of Tayloristic/scientific management tradition' that seems to stifle employee participation of Western workers as opposed to their Japanese counterparts. The various aspects and views need further research but it does show that the need exists for serious attention given to the move toward a more interpretive approach in TQM to realise the full potential of employee participation and empowerment.

2.4 SOME CONSEQUENCES OF THE TQM MODEL

Defining TQM, as has been done above, inevitably has many consequences. TQM is not a panacea that can be used unthinkingly, and implementing TQM without due consideration of the consequences implicit in the model and the principles of integration and participation could lead to the failure of such TQM efforts.

First, Implementing the TQM model presented should be seen as a problem of complexity with many interrelated aspects. Such problems are identified as 'messes' [Ackoff, 1981] and cannot be solved by traditional linear thinking [Voudouris, 1997]. The first consequence of this TQM model then is that firms should be looking towards new, systems-based, methods to introduce TQM. That is, methods that recognise and operationalise the concept of systemic complexity in problem solving.

Second, the integration of Quality and Environmental issues along with integrating 'hard' and 'soft' issues were found to imply a systems approach. The systems approach will be discussed in more detail in Chapter 3 and it would be possible, after such discussion, to evaluate the feasibility and mode of linking TQM with systems thinking. Several consequences for TQM implementation result, here reference should, however, be made

to one of the consequences involved in such an approach.

The principle of holism, [1] or the 'whole systems' view, holds a very important consequence for TQM, ie the principle that if the performance of each part of the system is individually maximised the system as a whole will not behave as well as it could [Dettmer, 1995]. Ackoff [1995 : 44] states:

"... improvement of the parts of a system taken separately may not, and usually does not, improve the performance of the whole and often reduces it."

Katz [1970 : 13] defines a 'General Management Point of View' and says:

"Every strategic action must strike a balance among so many conflicting values, objectives and criteria that it will always be sub-optimal from any single viewpoint. Every decision or choice affecting the whole enterprise has negative consequences for some of the parts."

The objectives and targets of separate parts (departments) of an organisation thus require trade-off management [Robbins, 1983]. The multiple objectives could not be independently managed and independently optimised. For the good of the whole organisation clear priorities and rational resource allocation would have to take cognisance of each part's impact on the whole. An example would be the obvious conflicting objectives involved in production volumes, quality and environmental impacts. The second consequence of the TQM model is that methods should be employed to address this multiple-objective, multiple-criteria nature of TQM, methods that will facilitate, what Mizuno [1988 : 9] calls, "multi-dimensional evaluations".

Third, the involvement of a wide spectrum of stakeholders brings with it the consequence of multiple perspectives and expectations. Each stakeholder will view TQM from an unique angle [Churchman, 1969]. The expectations of stockholders will differ markedly from that of employees, the expectations of senior managers from that of unionised employees [Conti, 1995]; [Holoviak, 1995]. This consequence is made the more serious by the inclusion of both quality and environmental matters into a common system.

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(1) The terms 'holism' and 'whole systems view' will be dealt with as aspects of systems thinking in 3.2.2.3 below.

The diverse views of organisational management and the environmental pressure groups are well known. Klaver & Jonker [1997a] argue for an integration of quality and environmental management but warn that conflicting objectives exist, particularly in the area of trying to satisfy the different stakeholder values and biases related to quality as opposed to environmental protection. An additional aspect of stakeholder involvement is that, over and above the views of different stakeholders to be considered, consideration should be given to whether an organisation views the different stakeholders in an 'unitary' or 'pluralist' way [Fox, 1974] or as McEwan [1996] suggests, combining both views in a 'complementarist' fashion.

The Social Action perspective, an attempt to view organisations from the standpoint of the individual actors who will each have their own goals and interpretations of the work situation, developed in reaction to other approaches, which were seen to disregard the individual actors' perspective in favour of that of the organisation [Mullins, 1996 : 58]. Two major ways of perceiving an industrial organisation can be identified. In the *unitary* approach the organisation is viewed as a team with a common source of loyalty, focus, goals and effort. The *pluralist* approach views organisations as made up of competing sub-groups with their own loyalties, goals and leaders. These subgroups are almost certainly to come into conflict. The unitary approach could be compared to agency theory, which recognises one line of responsibility of the manager, as agent of the shareholders, to the board of directors [McEwan, 1996]. Critics of this view propose a more 'pluralist' perspective expanding the hostile relationship between management and employees to a model of management being involved in a network of relationships with various stakeholders [Mullins, 1996 : 318]. McEwan [1996 : 3] argues that these, seemingly rival views, can be reconciled by reference to contingency approaches in which a balance, or mix, of these 'ideal-typical' forms can be achieved to meet the particular circumstances of the firm. The third consequence of the TQM model is that the approach should employ methods that will encourage and accommodate the diverse viewpoints and participation of different stakeholders.

Fourth, the final consequence is that TQM should be seen as a multi-paradigmatic approach. The notion of 'paradigm' is originally derived from Thomas Kuhn's seminal work *'Structure of Scientific Revolutions'* (1962). In Kuhn's view paradigm should be understood against the background of the historical growth and development of the sciences [Barnes, 1985]. Kuhn indicates that the history of scientific theories follows a clearly discernable pattern in which periods of *normal* science and scientific *revolutions* alternate. During normal science periods research efforts are largely devoted to the elaboration and extension of some generally accepted concrete scientific achievement [Barnes, 1985]. In scientific revolutions these old theories are increasingly confronted

with ill-fitting data until this contradictory evidence cannot be accommodated by the prevailing theories and they make way for a completely different way of looking at the data. This new achievement is acknowledged and accepted by a given scientific community as the basis for further research, heralding a new period of normal science [Mouton & Marais, 1991].

In its original meaning the term 'paradigm' was a powerful notion, resemblant, in one sense, of the *Weltanschauung* (2) [Hassard, 1990]. The term, however, was not used unambiguously by Kuhn himself [Tsoukas, 1994a] and has become more and more devalued, so that it is now employed at all levels of analysis, being substituted freely for terms such as perspective, theory, discipline, school or method [Hassard, 1990]. It is even used as an alternative for lateral thinking by authors like Stephen Covey and Joel Barker [Fogler & LeBlanc, 1995].

Kuhn's analysis has had a major impact on the philosophy and methodology of the social sciences [Mouton & Marais, 1991] and entered into organisation theory largely through the study of Burrell & Morgan [1979] [Tsoukas, 1994a]. In recent years the literature of organisation theory has been replete with assessments of its paradigmatic status [Hassard, 1990] and accounts of organisations and the framing of these accounts within paradigmatic frameworks have become a common place within the discipline [Willmott, 1990]. While the Burrell & Morgan [1979] scheme introduced the paradigm notion to organisation theory it has subsequently been criticised on two fronts; namely the incommensurability thesis and the actual paradigms defined.

Burrell & Morgan [1979] define four *mutually exclusive* paradigms, following Kuhn's original view that different paradigms are incommensurable [Tsoukas, 1994a]; [Barnes, 1985]. This thesis is defended by Tsoukas [1993, 1994a, 1994b] and Jackson & Carter [1991, 1993] inter alia; but also severely criticised by several authors (cf [Hassard, 1990]; [Willmott, 1990]; [Martin, 1990] and [Mouton & Marais, 1991] inter alia). The four paradigms, defined by Burrell & Morgan [1979 : 22], namely, Functionalist, Interpretive, Radical Structuralist and Radical Humanist are challenged both in terms of the number and exact descriptions of the paradigms. Examples of alternative schemes include: (i) Guba & Lincoln [1994] defining four, Positivism, Post-Positivism, Critical Theory and Constructivism; (ii) Hardy & Clegg [1996] using four, Normative, Interpretive, Critical and Post-modern;

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(2) The link between 'paradigm' and 'Weltanschauung', here, refers to their common meaning and does not posit any historical link between these two terms.

(iii) Following Habermas' theory of human knowledge constitutive interest, three paradigms, Positivist, Interpretive and Critical are distinguished by Kemmis, in educational research [Hart, 1990] and by Flood & Jackson [1991] in organisation theory; Cantrell [1990], analyses several schemes and settles on the three, Positivist, Interpretive and Critical Science. Based on this short discussion, three general positions emerged, which will be used in this thesis:

(i) The discipline of organisation theory is without a single dominant paradigm.

(ii) The scheme of three paradigms; Positivist, Interpretive and Critical is accepted while acknowledging the existence of other (similarly valid) schemes.

(iii) The term 'paradigm' is confusing and will be used exclusively to refer to the three traditions in (ii) above.

The link between TQM and the paradigms needs to be explicated. Several authors link TQM, or aspects related to it, to one or more of the three paradigms listed above and this is why TQM could be called 'multi-paradigmatic'. Spencer [1994] points to this by linking TQM to both *functionalist* and *interpretive* management models. Sitkin, et al [1994 : 541] define TQM as incorporating both *control* (TQC) and *learning* (TQL), indicating that these 'epistemologically incompatible' approaches should coexist synergistically. The opinion is often expressed that organisational change and learning can only take place within an *interpretive* framework (cf [Roos, 1996b]; [Fishman, 1997] and [Jonker & Klaver, 1997] inter alia). Anderson & Reeves-Ellington [1995] argue that TQM, in general, and supplier/customer relations and continuous improvement (both elements closely related to TQM), in particular, require an interpretive approach. Flood & Jackson [1991 : 21], on the contrary, argue that TQM's use of multiple metaphors, including *machine* and *organic* (functionalist) and *culture* (Interpretive) metaphors, is one of the strengths of this approach. Multi-paradigmatic thinking is, however, not without its critics (cf [Winch, 1958]; [Burrell & Morgan, 1979] and [Tsoukas, 1993, 1994a, 1994b] inter alia). This debate will be discussed later. Here it has been introduced to indicate that TQM is multi-paradigmatic and that this consequence needs careful consideration when a framework for implementation is constructed, ensuring that both the *strengths, weaknesses and threats* of a multi-paradigmatic approach are given full consideration.

2.5 SUMMARY

TQM defined in terms of expansions in width (quality plus environmental issues) and depth ('hard' plus 'soft' systems) implies a problem of complexity requiring a *systems* approach. The participation of diverse stakeholders implies a problem of multiple views requiring an *interpretive* approach. The consequential multi-criterial nature requires a *multi-criteria decision making* approach. A framework to implement TQM would, therefore, need to combine these three approaches. With these aims in mind, theoretical systems perspectives will be discussed in Chapter 3. In Chapter 4 the TQM perspectives (Chapter 2) and systems perspectives (Chapter 3) will be combined to define a theoretical framework for TQM implementation.

CHAPTER 3
SYSTEMS PERSPECTIVES

3.1 INTRODUCTION

The need for a systemic view of TQM was introduced in Chapter 2. It is, however, necessary to discuss the various aspects of what such a 'systemic view' involves, before the applicability of systems thinking to TQM can be explicated and a systemic framework for TQM implementation can be constructed. Short overviews of various systems approaches will be given, followed by a discussion of how these and other approaches could be better applied, when used from a Complementarist standpoint. Critical Systems Theory will be presented to justify the rationale for applying a Complementary approach. Finally, the multi-criteria decision making approach will be linked to systems thinking and its problem solving strength will be coupled with the problem structuring strength of the systems approaches.

3.2 GENERAL SYSTEMS THEORY

3.2.1 DEVELOPMENT OF SYSTEMS THEORY

Traditional thinking is firmly rooted in, what is called, the highly successful Cartesian or Baconian tradition of science. This tradition grew in stature from the work of Bacon, Descartes and Newton to its pre-eminent position during the latter part of the 19th and the early part of the 20th century.

The dominating view in this natural sciences tradition was that of reductionism, ie understanding complex phenomenon in terms of the parts it could be divided into. The need for a more holistic approach became evident because many, particularly biological, phenomena could not be explained by reductionist thinking [Koehler, 1938]. Such a synergistic view, in which the whole was seen as more than the sum of the parts, was developed by von Bertalanffy [1950]. This general systems theory, although developed for the biological sciences and living systems, was later used to integrate scientific knowledge across a broad spectrum of disciplines [Katz & Kahn, 1978], inter alia Economics [Boulding, 1972] and Social Systems [Luhmann, 1979]. Systems theory is claimed to have universal application; from cells to supernational systems [Miller, 1979];

from subatomic particles to civilisation [Bowler, 1981]. It became an ideal model to be used for organisations [Feibleman & Friend, 1945].

General systems theory should be seen as a conceptual paradigm or a specific point of view [Boulding, 1977]. Ackoff [1981 : 15] argues for a change of world view, away from what he calls the 'machine age' to the 'systems age'. Katz & Kahn [1978 : 15] point to the lack of adequate conceptual tools in organisational studies and suggest that this could be remedied by following the approach of open system theory. Katz [1970 : 16] defines a 'systemic' frame of reference in contrast to a 'elemental' frame of reference and points to the fact that the systemic frame of reference is essential to ensure management of the whole enterprise.

3.2.2 GENERAL SYSTEMS CONCEPTS

A system is a set of interrelated elements perceived as a conqruent whole [Ackoff, 1973], implying that systems are conceptual constructs and should, therefore, be seen from a constructivist point of view and not as 'real' objects. A system is not something *presented* to the observer, it is something to be *recognised* by him. Most often the word does not refer to existing things in the real world, but rather to a way of organising thoughts about the real world. This is not to say that real objects (eg a bicycle, the human body or an organisation) could not also be regarded as 'real' systems, but only that for the current discussion the emphasis will be on the 'system' as a *conceptual* tool, a way of perceiving, discussing and analysing the real world. This way the 'system' will be perceived (conceived) differently from observer to observer and from case to case. A passenger aeroplane could thus be seen, by a maintenance engineer in terms of physical dimensions, materials of construction, etc; by a commercial pilot as a 'place of work' in terms of the ease of handling in take off and landings, safety, etc; by a passenger in terms of safety, comfort, etc; and by somebody living near the airport as a noise producing nuisance [Wilson, 1990]. The view of a system, like the passenger aircraft, can change quite dramatically as would happen, for example, if the person near the airport was to win a free ticket and become a passenger. Statements are found, for example 'Organisations are open systems' [Mullins, 1996 : 55], seemingly, treating systems as real. This should, however, be understood to mean 'organisations can be described and analysed using systems theoretical concepts and principles'. Thus, organisations will not be seen as real systems but will be conceptualised as open systems.

Various characteristics of systems are listed by Kast & Rosenzweig [1985 : 107] and by Miller [1979 : 606]. For the current discussion the concepts particularly relevant are:-

3.2.2.1 A GENERAL SYSTEMS MODEL

Systems are generally depicted using a 5 element model ([Cronjé, et al, 1987 : 26]; [Mullins, 1996 : 80]; [Smit & Cronjé, 1997 : 49]):

(1) **Environment:** Systems are seen as part of a hierarchy of systems where each system is contained within a larger supra system, called the environment.

(2-4) **Input-Transformation-Output:** The open system is viewed as a transformation model. In a dynamic relationship with its environmental, it receives various inputs transforms these inputs in some way, and exports outputs to the environment.

(5) **Feedback:** The concept of feedback is important in understanding how a system maintains a steady state. Information concerning the outputs or the process of the system is fed back as an input into the system, perhaps leading to changes in the transformation process and/or future outputs. Feedback can be both positive and negative. Given negative feedback, a system's equilibrium state is invariant over a wide range of initial conditions. Given positive feedback, radically different end states are possible from the same initial condition. The condition reached with negative feedback is referred to as 'equifinality' and represents a profound difference between inanimate (closed) and living (open) systems [Von Bertalanffy, 1950]. In most physical systems, the final state is determined by the initial conditions. Take, for instance, the motion in a planetary system where the positions at a time t are determined by those of a time t_0, or a chemical equilibrium where the final concentrations depend on the initial ones. If there is a change in either the initial conditions or the process, the final state is changed. Vital phenomena show a different behaviour. Here, to a wide extent, the final state may be reached from different, initial conditions and in different ways. Such behaviour is called equifinal. Analysis shows that closed systems cannot behave equifinally. This is the reason why equifinality is, in general, not found in inanimate systems. But in open systems which are exchanging materials with the environment, in so far as they attain a steady state, the latter is independent of the initial conditions; it is equifinal.

3.2.2.2 OPEN AND CLOSED SYSTEMS

An important aspect of the systems view regards the distinction between **open** or **closed** systems and this is recognised widely [Bedeian, 1984 : 4]; [Robbins, 1983 : 10]; [Kast & Rosenzweig, 1985 : 103]; [Cronjé, et al, 1987 : 26]; [Silverman, 1970 : 32]; [Flood & Carson, 1988 : 7]; [Koehler, 1938]; [Von Bertalanffy, 1950 : 83]; [Emery & Trist,

1965 : 246]. An open system is seen as being in dynamic interaction with the environment while closed systems are seen as isolated from their environment. Von Bertalanffy [1950 : 83] defines these terms for physics and biology as: "A system is closed if no material enters or leaves it; it is open if there is import and export and, therefore, change of the components". Other formulations are very similar exchanging 'import and export' with 'interaction' [Kast & Rosenzweig, 1985 : 103]; [Robbins, 1983 : 10]. The closed/open aspect of systems are not to be seen as a dichotomy but as a continuum with most systems exhibiting mixed forms between fully closed and fully open [Robbins, 1983 : 11]; [Kast & Rosenzweig, 1985 : 107]; [Silverman, 1970 : 33]; [Emery & Trist, 1960 : 321]. Von Bertalanffy [1950] first introduced this general distinction in contrasting biological and physical phenomena. He gives as an example of a closed system, the *planetary system* [Von Bertalanffy, 1950 : 89], while seeing all *organisms* as open systems; Flood [1993 : 81] points out that the Newtonian Mechanics is based on 'closed systems'; Kast & Rosenzweig [1985 : 103] indicate that *physical* and *mechanical* systems are closed and in Boulding's [1956] systems hierarchy, systems at levels 1, 2 and 3 are seen as closed systems with examples of bridges (at level 1) and clocks (level 2).

The fact that organisations must be seen as **open** systems is wide-spread (cf inter alia [Kast & Rosenzweig, 1985 : 106]; [Flood & Carson, 1988 : 75]; [Cronjé, et al, 1987 : 27]; [Robbins, 1983 : 10]). Often the 'open systems view' is compared, and claimed superior, to the 'closed systems view' [Katz & Kahn, 1978].

An apparent contradiction, between the fact that the environment is an important general systems element and the isolation from this environment in 'closed' systems, presents itself. That closed systems thinking is not proper systems thinking is Ackoff's [1973 : 326] view when placing 'closed' systems approaches, not in the 'systems age', but as 'machine age thinking'. Should then 'closed' systems be seen as a form of systems thinking or should only 'open' systems be regarded as 'true' systems? In terms of organisation studies, Robbins [1983 : 10] emphasises that no student of organisations could build much of a defence for viewing organisations as closed systems. Interestingly, Mullins [1996] confines his discussion mainly to the organisation as an open system, and so do Smit & Cronjé [1997].

Two opposite perspectives on the system/environment link can be shown to converge and provide an interesting consequence for organisational control. First, 'closed' systems are not always closed. The 'systems', as used by the physical sciences in general and thermodynamics in particular, are often identified as 'closed', ie isolated from their environments, and thus subject to the second law of the thermodynamics (increase in

entropy or the decrease of order towards randomness), (cf [Katz & Kahn, 1978 : 23]). The argument then normally contrasts this with 'open' systems that, through input from their environments, can arrest, or reverse, the increase in entropy and actually grow and expand in complexity. This view does not do the facts justice, as the whole discipline of thermodynamics is concerned with (closed) systems exchanging energy and work with their surroundings (environments) (cf [Sears, 1953]; [Barrow, 1988]; [Moran & Shapiro, 1993]; and [Sandler, 1989] inter alia). The processes that thermodynamics are concerned with, and in which cases all changes amount to an increase in entropy, are clearly denoted as *spontaneous* [Moran & Shapiro, 1993 : 149]; [Sandler, 1989 : 84], and the possibility of negative entropy in physical or chemical systems is acknowledged provided that a specific process is available to offset the spontaneous entropy increase. It follows then that it is simplistic to attribute the possibility of negative entropy, growth and elaboration only to whether a system is 'open' as opposed to being 'closed'. The existence of an entropy-reversing process must be seen as part of this systems' attributes.

Second, 'open' systems are not always open. This reflects the view that systems could be seen as autopoietic, ie a system capable of reproducing itself as an autonomous and self-organising unit by interaction of the internal elements of the system [Paetau, 1995]. This theory, developed by Maturana for the biological sciences, was adapted to social systems by Luhmann and can, in the terms of Maturana, be called operatively closed. With operational closure is not meant that the system is isolated from its environment. A flow of energy is presumed [Paetau, 1995], but like cells, which are open to energy but closed to information and control, autopoietic systems are open to receive signals from their environments. However, these signals only occasionally lead the system to change its internal operation - the part of the system which is closed. These internal 'rules' governing the system's primary activity, continuous maintenance, only change when the external signals stimulate processes that already exist within the system [Roos, 1996a].

Both these perspectives hold a very important consequence for organisational management. No organisation can be treated as a closed system, ie as isolated from its environment, but the mere fact of openness would not necessarily include change, growth and elaboration (negative entropy), specific processes (management) should be operative to ensure that environmental messages and influences are heeded and that internal elements (vision, culture) are required to absorb the necessary information to promote change [Mulej & Rebernik, 1994]. The operational closure view is supported by Child [1972]. Child argued that organisations are not as tightly coupled to environments as implied by most versions of contingency theory and he criticised structural contingency theories for neglecting the importance of strategic choice by managers.

Both arguments thus converge and emphasise the importance of managerial influence and control [Day & Lord, 1986].

3.2.2.3 HOLISM AND REDUCTIONISM

A second important aspect of the systems view of organisations is that it emphasises the integration of various functions and the attention required in ensuring a congruent whole as opposed to a more piecemeal emphasis of the reductionist view. Ackoff [1973, 1981] defines the newer 'systems age' in contrast to the older 'machine age' and identifies the latter in terms of *reductionism* and the former in terms of *expansionism.*

Reductionism consists of the belief that everything in the world and every experience of it can be reduced, decomposed, or disassembled to ultimate simple elements or indivisible parts [Ackoff, 1973 : 325]. This is also known as Atomism [Dowling, 1967]; [Cohen, 1968]. Reductionism gave rise to an analytical way of thinking about the world and understanding it. Analysis consists of first disassembling phenomena into their parts, secondly explaining the behaviour of the parts and finally, aggregating these explanations into an explanation of the whole. Atomism stresses the reality of the ultimate simple parts and the unreality of any grouping of these parts [Dowling, 1967]. Reductionism is also based on three mechanistic determinism propositions; (i) the ultimately simple cause-effect relation as being an adequate explanation of all phenomena; (ii) deterministic in that effects are completely determined by causes; and (iii) mechanistic, because no need was seen for reference to any teleological concepts, such as goals, purpose, choice and free will. Two forms of atomism are: (i) The theories of Hobbes, called Political Atomism, which deny the dependence of individuals upon social institutions, these being chargeable and dependant on the individual and serving him; (ii) The views of Russell in modern logic, called Logical Atomism, perceive reality being confined to ultimate irreducible simple facts in contrast to the unreality, of any structure of thought into which these 'atomic' facts might enter [Dowling, 1967].

Expansionism, on the other hand, focuses on the wholes of which objects and events are parts. It turns attention from elements to a whole with interrelated parts, to systems [Ackoff, 1973 : 327]. A system is more than the sum of its parts; it is an indivisible whole and exhibits properties none of its elements exhibit individually, eg the human body can perform functions none of its organs can perform on their own. Expansionism, or holism [Jackson, 1991 : 7], brings with it the synthetic mode of thought, explaining things as parts of greater wholes and their roles in that larger system. The philosopher EA Singer and later the biologist Sommerhoff [1969] came independently to the same conclusion that functional, goal seeking and purposeful behaviour could be studied

objectively and scientifically, thus bringing teleology into science and changing conceptualisations of the world [Ackoff, 1973 : 329].

In contrast to Ackoff [1973] and Jackson [1991], reserving the terms systems approach to the expansionist, or holist approach, Müller-Merbach [1994] defines both approaches as systemic, calling the reductionist view, *Introspection-Analytic Reduction* [1994 : 18] and holism, *Extraspection-Synthetic Integration* [1994 : 19]. He continues by defining a third approach, *Construction-Creative Design* which implies an simultaneous application of the principles of the first two [1994 : 20]. Flood & Carson [1988 : 14] agree and point out that a systems scientist must be both a holist and a reductionist at the same time. Cohen [1968] sounds a warning in this regard when social phenomena are concerned. The holistic approach has tended to treat societies or social wholes as having characteristics similar to those of organic matter or organisms while the atomistic approach has treated social wholes as having characteristics similar to mechanical objects. One could accept these two approaches as simply emphasising different aspects of social reality and as complementary. This Cohen [1968 : 14] argues is not the case specifically because individuals in society have characteristics (personality, biological, etc) which are not determined by the societal whole to which they belong and through free will may react differently to the demands made by the society or organisation. This agrees with the view of Silverman [1970 : 31] that organisations may be systems but not necessary natural systems.

The principle of systems **hierarchy** now needs to be considered. All systems are composed of interrelated subsystems and simultaneously are part of a bigger supra-system [Flood & Carson, 1988 : 15]. An investigation from the system to its supra-system could then be called expansionist [Ackoff, 1973], holistic [Jackson, 1991] or extraspection [Müller-Merbach, 1994]; while investigating from the system to its subsystems could be called reductionist [Ackoff, 1973]; [Jackson, 1991] or introspection [Müller-Merbach, 1994]. The importance of this systems concept for management and the organisation is stressed by Smit & Cronjé [1997 : 63] indicating that for the organisation this concept of the systems theory means the synchronisation or joint application (implementation) of individual subsystems in such a way that the result of their simultaneous application is greater than the sum total of their individual efforts.

Although the expansionist view is stressed, this must not be seen as indicating a move away from reductionism to expansionism, with the implicit suggestion of replacing an older, incorrect approach with a newer improved one. Rather, should be stressed that both approaches have an important contribution to make, albeit to different problem sets. The current stress on holism should be seen in the light of the TQM theme, regarded here as a 'messy' problem best addressed using a systems approach [Petkov, et al, 1998].

3.3 ORGANISATIONS-AS-SYSTEMS APPROACH

3.3.1 DESCRIPTION

The view of organisations as open systems is the result of two parallel developments in thinking flowing from the natural sciences' pre-eminent position during the latter part of the 19th century. First, the mechanistic ('Cartesian') view dominating scientific thinking, was formally introduced to management theory by Taylor [1947] in his 'scientific management' and Fayol [1949] through his 'administrative management theory' [Bedeian, 1984]. The conflict between 'management' and 'labour' has a long history, which is seen as having intensified with the sweeping changes introduced by the Industrial Revolution [Thompson, 1968]. The split between management and workers became more pronounced and this conflict required more careful handling. Particularly, management tried to rid labour of its disposition to irregular work habits [Bendix, 1974] using different (sometimes crude) methods [Pollard, 1965]. Scientific Management can be viewed as one of the first, and surely the best known, attempts to deal systematically with this 'labour problem' [Jaffee, forthcoming]. The goal was to base management on a sound scientific base with clear laws, rules and principles [Taylor, 1947 : 159]. These views emphasised the technical issues, often at the expense of the human factors. In reaction to this one-sided approach [Joubert & Steyn, 1965 : 121], and flowing from the work of Mayo and the Hawthorne studies [Robbins, 1989], developed the Human Relations Approach. In this approach the notion that work performance is determined by the social situation of workers, their interaction and psychological rewards is emphasised in direct contrast to the scientific management view. Second, the establishment of the General Systems Theory popularised the organisations-as-open-systems view and combined within it, the holistic approach and a partial synthesis of the Scientific Management and Human Relations movements [Joubert & Steyn, 1965 : 124]; [Mullins, 1996 : 55].

Three main streams of thought can be identified within the organisations-as-systems perspective.

First, the **general systems** perspective in which the enterprise is viewed as an open system using the concepts and analogies from General Systems Theory.

Second, the **socio-technical systems theory** (STS) [Emery & Trist, 1960] in which organisations are seen as an integrated whole consisting of both technical and human subsystems. The socio-technical system is particularly concerned with the interaction between the psychological and social factors and the needs and demands of the human part of the organisation, and its structural and technological requirements. STS is explicitly grounded in General Systems Theory and sees the technical and social systems as independent, but linked [Manz & Stewart., 1997]; [Emery & Trist, 1960].

The idea of socio-technical systems arose from the work of Trist and others, at the Tavistock Institute of Human Relations in Britain [Brown, 1980]. They studied the effect of changing technology in the coal- mining industry in the 1940s. The increased use of mechanisation and the introduction of coal-cutters and mechanical conveyors enabled coal to be extracted by a new 'longwall' method [Mullins, 1996]. The 'longwall' method was socially disruptive and did not prove as economically efficient as it could have been with this new technology. The Tavistock researchers, in cooperation with coal mining managers, [Trist & Bamforth, 1951] saw the need for a socio-technical approach in which an appropriate social system could be developed in keeping with the new technology. This approach relies heavily on group-oriented approaches [Robbins, 1989] originally called 'semi-autonomous work groups', but this term was gradually been replaced with the term 'self-managing groups' [French & Bell, 1984 : 204]. Other research, with semi-autonomous work groups, followed the Tavistock research in India (cf [Rice, 1970]), Norway, Sweden and in the USA. A more recent heritage of these experiments has been the emergence of *work restructuring* projects such as the Volvo plant at Kalmar, Sweden and the General Foods pet food plant at Topeka, Kansas [French & Bell, 1984 : 204]. The link between the social and technical subsystems demands that although the way in which work is organised may be limited by technical demands, the work (social) organisation has properties of its own, independent of technology. These two elements are, however, closely interwoven and are also inevitably linked to a third element - the commercial success of the enterprise [Brown, 1980 : 1]. The original researchers suggested three subsystems common to any organisation: (i) Technological; (ii) Formal Role Structure; and (iii) Individual members' feelings and Sentiments [Mullins, 1996 : 84]. This was later expanded by Kast & Rosenzweig [1985 : 113-115] to five major subsystems:

- **Goals and values** - the accomplishment of certain goals determined by the broader system and conformity with social requirements.

- **Technical** - the knowledge required for the performance of tasks, and the techniques and technology involved.

- **Psychosocial** - the interactions of individuals and groups, and behaviour of people in the organisation.

- **Structure** - the division and co-ordination of tasks, and formal relationships between the technical and psychosocial subsystems.

- **Managerial** - covering the whole organisation and its relationship to the environment, setting goals, planning, structure and control.

Another development was that the original view of a relative fixed technical subsystem to which the social system was to be 'fitted', changed to a view of modifying *both* subsystems to obtain an optimal fit [DeGreene, 1982 : 55].

Third, the **contingency approach**, which can be seen as *an extension of the systems approach* [Mullins, 1996 : 56]; [Smit & Cronjé, 1997 : 48], highlights possible means of differentiating among alternative forms of organisation structures and systems of management. *There is no one optimum state*, and the structure of the organisation and its 'success' are dependent, that is contingent upon, the nature of tasks with which it is designed to deal and the nature of environmental influences. The most appropriate structure and system of management is therefore dependent upon the contingencies of the situation for each particular organisation.

Situational factors may be identified in different ways. The more obvious bases for comparison include the type of organisation and its purpose; power and control; history; and the abilities, skills and experience of its members [Mullins, 1996]. A number of studies have been carried out to determine the extend to which other contingencies influence organisational design and effectiveness. The variables researched were size, technology and the environment.

(i) Size of the Organisation

The size of the enterprise has obvious implications for the design of its structure. Studies done suggest that size has important implications for organisational design. Size explains best many of the characteristics of organisation structure [Mullins, 1996 : 371] for example the importance of standardisation through rules and procedures as a mechanism for co-ordination in larger organisations [Robbins, 1989 : 415]. Size, however, is not a simple variable and there is conflicting evidence on the relationship of size to structure and operation of the organisation. Important studies in this field include that of Porter, et al, finding that in larger subunits there appeared to be a negative relationship to job satisfaction, absenteeism and staff turnover [Mullins, 1996 : 372]; and that of Child who acknowledges the tendency of bigger companies to exhibit increased bureaucracy [Child & Mansfield, 1972].

(ii) Technology

Two major studies concerning technology are:-

(a) The Woodward Study

A major study of the effects of technology on organisation structure was carried out by Joan Woodward [Woodward, 1958]. In this study the firms were divided into 3 types of production systems; unit and small batch production; large batch and mass production; and process production. The research showed that the firms varied considerably in their organisation structures and that many of these variations appeared to be linked to the different manufacturing techniques. Woodward acknowledges that technology is not the only variable which affects organisations but draws attention to the importance of technology, organisation and business success [Woodward, 1958].

(b) The Work of Perrow

The work by Woodward was extended by Perrow [1967] who drew attention to two major dimensions of technology:

(1) *Variability* refers to the number of exceptional or unpredictable cases and the extent to which problems are familiar. For example, a mass production factory is likely to have only a few exceptions but the manufacture of a designer range of clothing would have many exceptional and unpredictable cases.

(2) *The analysis of technology* refers to the extent to which the task functions are broken down and highly specified, and the extent to which problems can be solved in recognised ways or by the use of routine procedures [Mullins, 1996 : 377].

Combining the two dimensions provides a continuum of technology from Routine to Non-routine. With non-routine technology there are a large number of exceptional cases involving difficult and varied problem solving. The two dimensions of variability and the analysis of problems can be represented as a 2 x 2 matrix, with different forms of technology in each of the 4 matrix areas. The classification of each type of technology related to a particular organisation structure. Perrow [1967] suggests that by classifying organisations according to their technology and predictability of work tasks, we should be able to predict the most effective form of structure. Variables such as the discretion and power of subgroups, the basis of co-ordination and the inter-dependence of groups result from the use of different technologies. In the *routine type of organisation* there is minimum discretion at both the technical and supervisory levels, but the power of the middle management levels is high; co-ordination is based on planning; and there is likely to be low interdependence between the two groups. This arrangement approaches a bureaucratic structure. In the *non-routine type of organisation* there is a high level of discretion and power at both the technical and supervisory levels; co-ordination is through feedback; and there is high group interdependence. This model resembles an organic structure.

(iii) The Environment

Two important studies which focused not just on technology but on the effects of uncertainty and a changing external environment on the organisation, and its management and structure, are those by:

(a) The Burns and Stalker Study

The study by Burns and Stalker [Burns, 1963] was an analysis of 20 industrial firms in the United Kingdom and the effects of the external environment on their pattern of management and economic performance [Mullins, 1996 : 378]. The firms were drawn from a number of different industries: a rayon manufacturer; a large engineering company; Scottish firms attempting to enter the electronics field; and English firms operating in varying sectors of the electronics industry. From an examination of the settings in which the firms operated, Burns and Stalker distinguished five different kinds of environments ranging from 'stable' to 'least predictable'. They also identified two divergent systems of management practice and structure - the *'mechanistic' system* and

the *'organic' system.* These represented the polar extremes of the form which such systems could take when adapted to technical and commercial change. Burns and Stalker suggested that both types of system represented a 'rational' form of organisation which could be created and maintained explicitly and deliberately to make full use of the human resources in the most efficient manner according to the circumstances of the organisation.

The mechanistic system is a more rigid structure and more appropriate to stable conditions. The characteristics of a mechanistic management system are similar to those of bureaucracy. It is characterised by: the specialisation of tasks; closely defined duties, responsibilities and technical methods; a clear hierarchical structure; knowledge centred at the top of the hierarchy; the tendency for vertical interaction between superior and subordinate; the use of instructions and decisions by superiors on methods of operation and working behaviour; and insistence on loyalty to the organisation and obedience to superiors.

The organic system is a more fluid structure appropriate to changing conditions. It appears to be required when new problems and unforeseen circumstances arise constantly and require actions outside defined roles in the hierarchical structure. The organic system is characterised by: the contribution of special knowledge and experience to the tasks of the organisation; the adjustment and continual redefinition of tasks; a network structure of control, authority and communication; technical or commercial knowledge located throughout the organisation, not just at the top; superior knowledge not coinciding necessarily with positional authority; a lateral direction of communication, and communication based more on information and advice than instruction and decisions; commitment to the common task of the organisation; and the importance and prestige attached to individual contribution.

Although the organic system is not hierarchical in the same sense as the mechanistic system, it is still stratified, with positions differentiated according to seniority and greater expertise. The location of authority, however, is by consensus and the lead is taken by the 'best authority', that is the person who is seen to be most informed and capable. Commitment to the goals of the organisation is greater in the organic system, and it becomes more difficult to distinguish the formal and informal organisation. The development of shared beliefs in the values and goals of the organisation in the organic system runs counter to the co-operation and monitoring of performance achieved through the chain of hierarchical command in the mechanistic system.

Burns and Stalker point out that there are intermediate stages between the two extreme systems which represent not a dichotomy but a polarity [Burns, 1963]. The relationship between the mechanistic and organic systems is not rigid. An organisation moving between a relatively stable and a relatively changing environment may also move between the two systems [McEwan, 1996 : 3].

(b) The Work of Lawrence and Lorsch

Lawrence & Lorsch [1967] undertook a study of six firms in the plastics industry followed by a further study of two firms in the container industry and two firms in the consumer food industry. They attempted to extend the work of Burns and Stalker and examined not only the overall structure, but also the way in which specific departments were organised to meet different aspects of the firm's external environment [Mullins, 1996 : 381]. The internal structures of the firms were analysed in terms of *'differentiation'* and *'integration'*.

Differentiation describes 'the difference in cognitive and emotional orientation among managers in different functional departments' with respect to: the goal orientation of managers, for example the extent to which attention was focused on particular goals of the department; the time orientation of managers and relation to aspects of the environment with which they are concerned, for example longer-term horizons, or short-term horizons and problems requiring immediate solutions; the interpersonal relations of managers to other members, for example a managerial style based on concern for the task, or on concern for people relationships; and the formality of structure, for example the extent of mechanistic or organic design.

Integration describes 'the quality of the state of collaboration that exists among departments that are required to achieve unity of efforts by the demands of the environment'. It is the degree of co-ordination and co-operation between different departments with interdependent tasks.

Lawrence and Lorsch's view of integration was not the minimising of differences between departments and the provision of a common outlook. It was the recognition that different departments could have their own distinctive form of structure according to the nature of their task, and the use of mediating devices to co-ordinate the different outlooks of departments. Given the possibility that different demands of the environment are characterised by different levels of uncertainty, then it follows that individual departments may develop different structures. The study of the firms in the plastics industry supported this hypothesis and Lawrence and Lorsch found a clear

differentiation between the major departments of research, production and sales, for example:

- *Research* was more concerned with the long-run view and was confronted with pressures for new ideas and product innovation. The department operated in a dynamic, scientific environment and had the least bureaucratic structure..

- *Production* was more concerned with the here and now, short-term problems such as quality control and meeting delivery dates. The department operated in a fairly stable, technical environment and had the most bureaucratic structure.

- *Sales* was in the middle between research and production. The department was concerned with chasing production and has a moderately stable market environment.

The two most successful firms were those with the highest degree of integration and were also among the most highly differentiated. This view of differentiation and integration was confirmed in the subsequent study of firms in the container and consumer food industries. It was concluded that the extent of differentiation and integration in effective organisations will vary according to the demand of the particular environment [Robbins, 1989 : 416].

3.3.2 CRITIQUE OF THE ORGANISATIONS-AS-SYSTEMS APPROACH

The major strength of this approach is that viewing organisations as systems provides a richer picture of organisations than that supplied by the traditional and human relations models. The classical approach emphasised the technical requirements of the organisation and its needs - 'organisations without people'; the human relations approaches emphasised the psychological and social aspects, and the consideration of human needs - 'people without organisations' [Mullins, 1996 : 55]. The systems approach attempts to reconcile these two earlier approaches and focuses on the total work organisation and the interrelationship of structure and behaviour, and the range of variables within the organisation. Jackson [1991] points out that both mechanistic and organismic analogies are found in this approach, the latter dominating recent systems thinking. A warning must, however, be made. Using organismic analogies too strictly can lead to problems. Silverman [1970 : 62] criticises the open systems view of often making this mistake, and points out that humans in organisations are not like cells in an organism, but have much more freedom to pursue own goals. This would lead to a

greater variability in behaviour and to possible conflicts of perceived interests in organisations [Bowey, 1976].

Jackson [1991 : 68] lists the main criticisms against this approach and it is clear that the various charges all relate to the functionalist paradigm within which this approach operates [Burrell & Morgan, 1979] and a short discussion of this perspective is needed to put the critique in context. The structural-functionalist perspective is a theoretical orientation, well known to the biological sciences, which use it to examine the structural aspects of organisms, their interrelationships, and the functions they perform for the organism as a whole. The basic premise of this perspective in sociology is that one can explain various phenomena, particularly social structures, in terms of their consequences (or 'functions'). An element in this perspective is the notion of *system*, the idea that the various elements of society are related to one another in such a way that a change in one leads to changes in the other [Goodman, 1992 : 9].

The mode of social theorising which characterises this paradigm has a long history. Indeed, its pedigree can be traced back to the very roots of sociology as a discipline, and the early attempts of social philosophers to apply the ideas and methods of natural science to the realm of social affairs. It is a paradigm which, in many respects, has developed as a branch of the natural sciences and, to this day, in disciplines as avowedly 'social' as sociology, psychology, economics, anthropology and the like, natural science models and methods reign supreme in various areas of enquiry [Burrell & Morgan, 1979 : 41]. Given such an extensive history, it is difficult to locate a precise starting point. Elements of the paradigm can be traced back to the political and social thought of the ancient Greeks, but Auguste Comte is commonly regarded as the founding father of 'sociology' - in name if not entirely in substance [Goodman, 1992 : 6]. He believed that knowledge and society was in a process of evolutionary transition, and that the function of sociology was to understand the necessary, indispensable and inevitable course of history in such a way as to promote the realisation of a new social order. From Comte's point of view this evolution passed through three stages of development - 'the Theological, or fictitious; the Metaphysical, or abstract; and the Scientific, or positive'. Comte's vision was of a world in which scientific 'rationality' was in the ascendancy, underlying the basis of a well regulated social order and a sociology based on the models and methods employed in the natural sciences, addressing itself to the discovery of scientific laws which explain the relationships between various parts of society. In his writings Comte made much of the link between biology and social science. He saw biology as marking a decisive point of transition between sciences, in that it marked a distinction between the 'organic' and 'inorganic' and placed emphasis upon understanding and explanation within the totality of the living whole [Burrell & Morgan,

1979 : 42]. Comte thus laid the foundations for the mode of social theorising characteristic of the functionalist paradigm. Based upon the 'positive' model of the natural sciences, utilising mechanical and organic analogies, and advocating methodological holism.

Comte's work was developed further by the English sociologist Herbert Spencer. Spencer attempted to explain social order and social change by comparing society with a living organism. Using this 'organic analogy', Spencer saw society as a 'system' composed of interdependent parts. In his view, sociology uncovers the key social structures and examines how they function to produce a stable society. In these respects he was a forerunner of the 'structural-functionalist' school of sociological thought [Goodman, 1992 : 6]. Emile Durkheim, influenced by Spencer and Comte, was especially interested in what holds society together; the problem of social order. His approach was essentially functionalist; he explored what function various social elements serve in the maintenance of social cohesion. He focused on the importance of shared beliefs and values ('collective conscience') and on collective ritual [Goodman, 1992 : 7]. Durkheim also contributed to sociological methodology. He argued that sociology must study social 'facts' or forces that exist outside of individuals and constrain their behaviour. He incorporated many of Spencer's insights, derived from the use of organic analogy, into his analysis of social institutions [Burrell & Morgan, 1979 : 44].

It is through the notion of structural functionalism that the use of the biological analogy in the tradition of Comte, Spencer and Durkheim has had its major impact upon sociological thought. Building upon the concepts of holism, interrelationships between parts, structure, functions and needs, the biological analogy has been developed in diverse ways to produce a social science perspective firmly rooted in the sociology of regulation. Treating the external social world as a concrete reality, governed by observable functional relations amenable to scientific investigation through nomothetic methods, structural functionalism developed as the dominant paradigm for sociological analysis during the first half of the twentieth century [Burrell & Morgan, 1979 : 50]. Within the structural-functionalist paradigm proper, three contributions can be highlighted:

Robert Merton: His concern is with 'middle range' theories which can help to explain the consequences of one institutional area for another.

Phillip Selznick's contribution is particularly interesting since it represents the earliest attempt systematically to apply a functionalist perspective to the study of organisations [Selznick, 1948]. Selznick, like many subsequent writers, use the 'needs' of systems as his

basic conceptual tool. In attempting to satisfy its needs an organisation is faced by the tendency of its constituent parts to resist actions which did not serve their own purposes. Selznick calls this the problem of recalcitrance.

Talcott Parsons was the foremost structural-functional analyst in American sociology. And like Parsons, most contemporary functionalists find Spencer's analogy useful in focusing on society's structural elements (eg social institutions, organisations, groups, social statuses) and their consequences (functions) for society as a whole [Goodman, 1992 : 9]. In Parsons's view, society is a relatively stable, well-integrated social system whose members generally agree on basic values. Society tends to be a system in equilibrium or balance. Since any social change has widespread disequilibrating effects, change tends to be frowned upon unless it occurs slowly enough to allow the system time to adjust. Parsons takes as his point of departure the system as a whole and analyses the conditions necessary for its survival, evolution and change. This leads Parsons to the notion of what are called 'functional prerequisites' or 'functional imperatives' - the functions which must be performed if a society is to survive [Parsons, 1951]; [Layder, 1994].

In returning to the main criticisms of the organisations-as-systems approaches they are shown to relate to the structural-functionalist base of these approaches. They see *survival* rather than *goal attainment* as the 'raison d'être' of organisations. They also emphasise the nonrational aspects of organisational functioning. Both these contribute to a neglect of the considerable amount of purposeful, goal-oriented activity that takes place in modern organisations [Jackson, 1991 : 68].

There is also a tendency in the organisations-as-systems approach to *reify* organisations - to grant them the power of independent thought and action. Thus activity in an organisation is seen as best explained by the organisation's desire to meet functional imperatives and to adapt to its environment. Individuals are seen as subject to forces that are beyond their control and that they do not always understand. Silverman [1970 : 50] agrees by pointing out that by moving away from the actor's definition of the situation and of the choices available to them, the risk is run to reify the systems that this approach constructs. Silverman [1970 : 52] points to Selznick's analysis that depends on the impersonal processes through which organisations function rather than upon the motivations of the actors. Organisational behaviour, Selznick suggests, must be analysed in terms of organisational response to organisational needs - a clear case of reification in which it is mistakenly assumed that the products of human endeavour (organisations) are, in fact, the work of non-human entities (organisational needs) [Layder, 1994].

Although internal tensions are admitted in the organisations-as-systems model, the main explanation provided for change is as an adaptive mechanism in response to environmental disturbances and pressures. Organisations seek as far as possible to maintain the status quo by preserving their existing structures. Structures are therefore seen as semipermanent features of organisations that should form the main focus of analysis. Processes operate to support structures. Structures are not temporary manifestations of process. Why organisations should wish to protect particular structures is not explained. The notion that social systems might frequently change their structure is not entertained [Bowey, 1976].

The emphasis on social order in organisations, to the exclusion of conflict and instability, is also regarded as one-sided. With the mechanical-equilibrium model, equilibrium is maintained by the inculcation of shared norms and values into organisational participants. The organismic model pictures all the parts as functioning in co-operation to serve the whole. Unity and interdependence of parts are stressed. The idea that there might be different groups in organisations pursuing their own rationalities, based on competing social and economic interests and frequently coming into conflict, is suppressed. Goodman [1992 : 10] agrees, indicating that the functionalist's view of organisations is that of stability with social change seen as disruptive. The functionalist view is thus inherently conservative and firmly rooted in the sociology of regulation [Burrell & Morgan, 1979 : 50]. Cohen [1968], however, disagrees. He argues that the chief substantive criticisms of functionalism are: it overemphasises the normative element in social life; it minimises the importance of social conflict at the expense of social solidarity; it stresses the harmonious nature of social systems; and, finally, it fails to account for social change and even treats this as abnormal. The first three objections are without foundation, he argues, and although some functionalists may tend to treat systems this way, there is nothing in functionalism as such which requires the adoption of these positions [Cohen, 1968].

The final substantive complaint, that functionalism cannot explain social change, is perhaps justified, argues Cohen, but not for the reasons that are normally given. The implication of this argument is that functionalism, by emphasising the conditions of persistence and stability, treats change as something abnormal and unlikely to occur except, perhaps, by accident. This argument appears plausible: if functionalism asserts that all items in a social system reinforce one another, then none can contribute to change, since each is kept going by the others. But in fact, if functionalism could really state the conditions under which social systems persist then it could also explain change simply by showing that some of those conditions are sometimes absent. Cohen [1968 : 58] states quite clearly that no functionalist has ever denied that social change is

'normal' and that it may result from conditions within the social system itself. This being so, if they really do have a theory of social persistence then they must also have a theory of change. In fact, some functionalist hypotheses are covert, but abbreviated, statements of social change. So for Cohen [1968 : 58], the problem is not that functionalists underplay conflict and change, but that they have not been able to produce a plausible theory of social stability, let alone a theory of social change. He is convinced that this is due to the fact that functionalist argumentation is tautologous in that needs are seen as explaining functions and the functions are explained as fulfilling the need [Cohen, 1968 : 51]. This argument is agreed to by Silverman [1970 : 67]; Goodman [1992 : 10]; and Lally [1976] who, in particular, shows that the criticism of the Frankfurt School is exactly that the notion of scientific objectivity, fundamental to the functionalist/positivist stance, causes the split between theory and practice. Functionalists, then, would prefer to *describe* an objective reality rather than try and *actively intervene* in social structures. In this way positivist sociology, the handmaiden of powerful interest groups, keeps up a steady flow of information to these groups and in spite of its 'hands off' policy is seen as most directly an agent of social control [Lally, 1976 : 65].

The functionalist underpinnings of organisations-as-systems could be seen as a problem by anyone that proposes the abandonment of such an 'impoverished' view and the adoption of a more 'liberal' stance (eg Silverman [1970 : 39] who suggests the Action Theory approach as an alternative [Lane & Jackson, 1995 : 221]). Within a complementary framework, however, it is a concern to be given consideration when methodologies are selected (see 3.6 below), but does not rule out the use of an organisations-as- systems approach. An approach attempting to link Systems Theory, Contingency Theory and Action Theory is found in Bowey [1976].

3.4 HARD SYSTEMS APPROACH

3.4.1 DESCRIPTION

During World War II, scientists assisted in creating and measuring radar-based air defence systems for the Royal Air Force. This was termed 'Operational Research' (OR) and quickly spread to other services and to the American armed forces. After the war this field grew quickly and became an important aspect of management in the 40s and 50s. Two related fields, that of Systems Analysis and Systems Engineering, became popular.

Systems Analysis (SA) - is the systematic appraisal of costs and other implications of meeting a defined requirement in various ways [Flood & Carson, 1988 : 108]. A standard approach could include 4 steps in a decision making process before the decision is implemented; (i) *Problem Analysis* to define the problem and cost the current system; (ii) *Generation of Alternative Solutions* to find alternatives to the current state and to cost these alternatives; (iii) *Evaluation of Alternatives* in terms of cost and benefits to compare various alternatives; and (iv) *Selection of the Optimal Alternative.*

Systems Engineering (SE) - comprises the set of activities that together lead to the creation of complex man-made entities and/or the procedures and information flows associated with their operation. The process can be described as consisting of 4 phases; (i) *Systems Analysis* comprising activities like Problem Formulation, projects organisation, system definition, system objectives definition; (i)) *System Design* including forecasting, model building, simulation, optimisation and control; (iii) *Implementation* when documentation and action approval is obtained and construction of the system is undertaken; and (iv) *Operation* including both the initial operation and retrospective appraisal of the project [Shelly, et al, 1995].

Operations Research (OR) - programmes essentially pass through 5 major steps iteratively; (i) *Formulation of the Problem*; (ii) *Construction of a Mathematical Model*; (iii) *Deriving a Solution to the Model*; (iv) *Testing the Model and Evaluating the Solution*; and (v) *Implementing and Maintaining the Solution.*

SE and OR are similar but do differ in that OR is normally concerned with existing systems while SE is concerned to create systems not yet in existence [Flood & Carson, 1988 : 108]. The underlying methodology of these fields is that of optimising via the use of mathematical and statistical models [Checkland, 1983]. The most obvious similarity between the three hard systems approaches is the explicit belief that any problem can be solved by setting objectives and then finding, from a range of alternatives, the one solution that will be optimal in satisfying these objectives [Flood & Carson, 1988]; [Ackoff, 1981].

3.4.2 CRITIQUE OF THE HARD SYSTEMS APPROACH

The same critique, of a functionalist philosophy and the use of empirical analytic methods, is levelled at the hard systems approaches as was the case for the organisations as systems approach, above. Interestingly, the weakness of the latter approach, in not giving adequate attention to goals, is also a weakness of the hard approaches, but then

due to their claimed overemphasis on goal attainment [Checkland, 1981].

The hard systems approach is also criticised for using a 'closed' systems view of organisations [Katz & Kahn, 1978 : 8]; [Kast & Rosenzweig, 1985 : 109]. The hard systems methods are based on the machine metaphor [Jackson, 1991 : 88]. In management and organisation theory, the machine view is typified by theories of bureaucracy (Weber) and scientific management (Taylor). A machine is recognised as a technical apparatus that has several (often standardised) parts each with a definite function. Much emphasis is placed on the efficiency of the parts. The machine operates in a routine and repetitive fashion and performs predetermined sets of activities, seeking the rational and efficient means of reaching preset goals and objectives. More generally, much emphasis is placed on control while little emphasis is placed on the environment [Flood & Jackson, 1991 : 8]. This machine view of social organisations are criticised for using thinking from the natural sciences and applying these to social situations. It is proposed that general laws in the social sciences are less tangible and cannot be established as there is the phenomenon of man's freedom of will to contend with [Flood & Carson, 1988 : 101]; [Ackoff, 1979 : 97]; [Checkland, 1985 : 761].

The hard systems approach is said to have a managerial bias. The problems it can address must either be so simple that a clear objective (goal) can be defined, or there being widespread agreement over objectives among the human beings who make up the system (which is likely to be quite rare) or an autocratic decision maker who can decide on the objectives of the system. This is the dangerous authoritarian implication of hard systems thinking when it is applied to many kinds of social systems. Hard systems theorists as scientists offer 'objective' knowledge about how systems should be organised. Their science enables them to prescribe the 'best' solution irrespective of the values of the individuals in the system [Jackson, 1991 : 86]. Pfeffer [1981] argues similarly that the norms and values of rationality and efficiency are strong and enhance the autocratic control by powerful elements even to the extend that the discussion of this power domination is suppressed in management literature.

The criticisms of hard systems thinking and the wide acceptance of the open systems view would seem to indicate either the inappropriateness, or the very limited application of hard systems thinking for TQM. The functionalist underpinnings and resulting criticisms of hard systems thinking need not, however, be seen as ruling out use of these methodologies. Jackson [1991 : 85] is quite adamant that there will be some problem situation in which hard systems methodologies yield the most satisfactory results. In this regard, Crossfield & Dale [1991] argue that the emphasis on 'soft' elements in TQM should be balanced with the appropriate use of 'hard' methods, like expert systems. An

interesting adamant view is stated by Hansen [1994] in which he argues that TQM is a soft, philosophical, people-centred approach and will **not** be effective to change organisations, what is needed is applying scientific, engineering practices (BPR) instead. His view is too radically biased towards the 'hard' approach but does serve to indicate that TQM cannot be understood without its 'mechanistic roots' [Spencer, 1994].

3.5 SOFT SYSTEMS APPROACH

3.5.1 DESCRIPTION

Although the field of Operational Research (OR), with its rich literature on mathematical modelling, queuing and games techniques, are still actively taught and practised around the world, serious criticisms have been levelled at it. These criticisms are not only voiced from outside the OR domain, but noticeably Ackoff [1979a, 1979b, 1995], one of the founding fathers, is quite severe in his attacks on the traditional paradigm and methodology of OR. The contention of Ackoff, Checkland [1981] and Jackson [1995] is that the traditional OR approach, although systems based, does not give adequate cognisance to the human activities and social interactions characterising real world problem (mess) situations. From this disappointment with traditional OR, and based on Churchman's [1968] philosophy, grew a rich list of literature propagating a 'softer' approach in which methods are used that, in the view of the Soft system thinkers, would address the shortcomings of OR. The problems identified with OR was not superficial in that adding some 'human relations' methods could fix it. The critics pointed out that the paradigm of OR was wrong and that it stood on shaky ground both sociologically and philosophically. Checkland [1983 : 672] attacks the OR view of seeing real systems in the world. He agrees that a natural system (eg a bicycle) could be testable and modelled but a description of a human activity system cannot. It is his contention that all systems involving human activities and relations can only be understood from the worldview (*Weltanschauung*) of each observer and, therefore, each such understanding will be different. In this context he criticises the *functionalist* sociological and *positivist* philosophical foundations of OR. The soft systems theory attempts to correct these problems by not assuming the existence of real world situations but only different models (based on different *Weltanschauungen*) of observers. This approach is underpinned by an *interpretive* sociology and a *phenomenological* philosophy.

Burrell & Morgan [1979 : 253] state that the interpretive paradigm is significantly different from the functionalist paradigm. Theorists within the interpretive paradigm tend to share a common perspective, in that their primary concern is to understand the

subjective experience of individuals. Their theories are constructed from the standpoint of the individual actor as opposed to the observer of action; they view social reality as an emergent process - as an extension of human consciousness and subjective experience. All theories constructed in the context of the interpretive paradigm are anti-positivist. They reject the view that the world of human affairs can be studied in the manner of the natural sciences. In the context of the interpretive paradigm the central endeavours is to understand the subjective world of human experience. Churchman's [1968 : 231-232] own summation of his systems approach is captured in 4 principles:-

"1. The systems approach begins when first you see the world through the eyes of another.
2. The systems approach goes on to discovering that every world view is terribly restricted.
3. There are no experts in the systems approach.
4. The systems approach is not a bad idea."

In these principles the interpretive character of Churchman's philosophy is quite clear; that the world must be seen as the subjective experience of the actors and not as some objectivity defined 'expert' opinion; and that the different worldviews will always be restricted due to this subjectivity, but that through an acceptance of Hegelian dialectical debate, between different views, a better synthesis can be established [Flood & Jackson, 1991 : 121]. Another very important shift in paradigm, from hard to soft systems thinking, relates to the objective of the methodologies. Checkland [1983 : 667] explains this, in terms of SSM, as a methodology of *enquiring* and *learning*, rather than *optimising*.

Two methodologies from this paradigm need mentioning:-

3.5.1.1 SOFT SYSTEMS METHODOLOGY (SSM)

Checkland developed this highly interpretive methodology in an attempt to address human activity systems, for which, in his view, hard systems methodologies were inadequate. SSM is based on 5 general assumptions [Checkland, 1989 : 78-81]:-

(i) SSM is a process for managing, and takes a particular view of what 'managing' is. Managing is interpreted very broadly as a process of achieving organised action; it is not restricted to the activities of the particular professional class as exists in organisational hierarchies.

(ii) SSM then assumes that different individuals and groups, being ultimately autonomous, will make different evaluations leading to different actions. This creates issues; with which the manager must cope. Organisational life would not be possible if

perceptions and evaluations did not to some extent overlap. The overlap will never be complete, and the issues which arise from the mismatch provide much of the substance of managerial work.

(iii) SSM assumes, further, that in articulating the process of perceiving, evaluating and deciding, systems ideas will be helpful. 'System' is defined within SSM as a whole which has properties as a single entity, so-called 'emergent properties'. This definition is essentially the same as that used in GST.

(iv) SSM assumes that along the concepts of 'natural' systems (systems created by Nature) and 'designed' systems (systems created by Man) must be placed a new concept, that of 'human activity' systems. Checkland [1989] points out that to talk of purposeful activity only in terms of a particular interpretation, bias, prejudice or value system means that we have to accept (a) that there will be multiple possible descriptions of any named real-world purposeful action, and (b) that any description of purposeful activity will have to be explicit concerning assumptions about the world which that description takes as given, the *Weltanschauung* which makes that description meaningful.

(v) The fifth basic characteristic of SSM is an enquiring process: SSM learns by *comparing* pure models of purposeful activity with perceptions of what is going on in a real-world problem situation. SSM provides a highly explicit kind of comparison based on system models used in an organised process which is itself a learning system. The purpose of this comparison, carried out in the later stages of the SSM approach, is to achieve a readiness to take action purposefully in the problem situation in question.

The SSM process can be described in the earlier 7 stage model [Checkland, 1981] or as two interactive processes called 'Stream of Logic Based Enquiry' and 'Stream of Cultural Enquiry' [Checkland & Scholes, 1990]. Following this newer structure, the methodology can be summarised as:-

(i) Stream Of Logic Based Enquiry

SELECTING RELEVANT SYSTEMS - No human activity system is intrinsically relevant to a problem situation and the choice of relevant system is always subjective. Choices must be made and through a process of learning the 'relevant' systems discovered. Two types of systems are distinguished, (1) 'Primary task' systems corresponding with organised purposeful action visible in the real world and (2) 'Issue based' systems that would not necessarily be expected to be found in the real world.

NAMING RELEVANT SYSTEMS - Root definitions of the relevant systems are prepared. These RD's are written as sentences elaborating on the core transformation (T: Input -› Output) by using the CATWOE mnemonic. The core of CATWOE is the pairing of the transformation process (T) with the Weltanschauung (W) that makes it meaningful, adding the ideas that someone must undertake the activity (Actor), someone could stop it (Owner), someone will be its victim or beneficiary (Customer) and that this system will encounter environmental constrains (E). The structure of CATWOE implies that the simplest version of a root definition would be 'a system to do X' where X is a particular transformation process. This leaves the system itself to select a means of doing X (there may be several available); it would freely choose a 'how' for the 'what' defined by X. Or it may be felt useful to constrain the system to a particular 'how', so that the next most complicated form of root definition will be 'a system to do X by Y'. Now, the existence of O in CATWOE implies the concern of someone (or some group) who could stop the activity of the system if it were not meeting their aspirations. This implies that a 'full' root definition's core transformation would be *'a system to do X by Y in order to achieve Z'*, where the T will be the means Y, Z is related to the owners' longer term aims, and there must be an arguable connection which makes Y an appropriate means for doing X. In general it is useful to write root definitions with the XYZ formula in mind [Checkland & Scholes, 1991 : 36].

MODELLING RELEVANT SYSTEMS - RD's are then modelled by assembling and structuring the minimum necessary activities to carry out the transformation process. This system model is enhanced by the addition of 2 evaluation systems. One to judge the efficacy and efficiency and the second to judge the effectiveness of the actions.

COMPARING MODELS WITH PERCEIVED REALITY - The models are used to have structured, coherent debate about the problematic situation in order to improve it. Four ways of doing the comparison was listed by Checkland [1981] of which the one used most often entails using the models to determine questions to be asked about the real world.

(ii) Stream Of Cultural Enquiry

A second, interrelated process must run along with the first. In this stream of enquiry the objective is to ensure that the 'culture', in which the problem exists and the improvements are sought, constantly informs the activities of the logic-based enquiry.

RICH PICTURES - The problem situation is represented in the form of the so-called 'rich picture'. Although no formal structure exists, the rich picture captures and represents the essence of the situation [Checkland & Scholes, 1990 : 45]. Such representations allow for the accentuation of issues, conflicts and other problematic or interesting features, particularly, the process, structure, stakeholders and Weltanschauungen [Flood & Jackson, 1991 : 173]. Root definitions can be represented pictorially from different Weltanschauungen, to highlight important differences caused by the various views [Petkov, et al, 1998].

ANALYSIS OF 'INTERVENTION' - The intervention is analysed by highlighting 3 roles: (1) The role 'client' (who cause the intervention to take place); (2) The 'would-be problem solver' (who conduct the study) and crucially important; (3) The 'problem owners'. The list of problem owners must be drawn up by the 'problem solvers' because nobody is intrinsically a problem owner [Checkland & Scholes, 1990 : 48]. This list should include, at least, the 'clients' and the 'problem solvers'.

ANALYSIS OF 'SOCIAL SYSTEM' - The model used by Checkland & Scholes [1990 : 49] assumes a social system to be a continually changing interaction between the three elements: roles, norms and values. By 'role' is meant a social position, either institutionally or behaviourally defined. A role is characterised by expected behaviours (norms) and judged according to local standards (values).

ANALYSIS OF 'POLITICAL SYSTEM' - It is accepted that every human situation will have a political dimension that needs to be explored. Politics is taken to be the power-related activity concerned with managing relations between different interests. A general model is used in this analysis. The question: "How power is expressed" is analysed in terms of (1) What are the 'commodities' through which power is expressed; (2) How are these commodities obtained; and (3) Through what mechanisms?

(iii) Making Desirable And Feasible Changes

SSM's aim will be to *do* something about a situation regarded as unsatisfactory. The two streams of thinking converge in a debate concerned with defining changes which would help remove the dissatisfaction. These changes must comply to two criteria: (1) Systemically desirable (when 'relevant systems' are in fact perceived to be truly relevant) and (2) Culturally feasible (changes suggested have to be regarded as meaningful within the culture in question) [Checkland, 1985].

3.5.1.2 STRATEGIC ASSUMPTIONS SURFACING AND TESTING (SAST)

SAST, like SSM, is grounded in the philosophy of Churchman and is meant to be used with messes, sets of highly interdependent problems, where problem formulation and structuring assume greater importance than problem solving. The philosophy of SAST is based upon four arguments about the nature of problems and their resolutions [Flood & Jackson, 1991]:

(i) Most strategic problems in organisations are ill-structured, wicked problems of complexity.

(ii) Most organisations fail to deal properly with messes because they find it difficult to challenge, seriously, accepted ways of doing things.

(iii) Challenging current policies necessitates the generation of radically different policies or theories, based upon alternative world views and in opposition to one another, capable of interpreting the policies differently.

(iv) Organisations are arenas of conflict between groups expressing alternative world views. This offers great potential for developing alternative strategies and policies, but it must be managed. SAST attempts to surface conflicts and to manage them to achieving a genuine synthesis.

SAST is based on 4 principles incorporated into the methodology. These are summarised by Flood & Jackson [1991 : 123] as:

"**Adversarial** - based on the belief that judgements about ill-structured problems are best made after consideration of opposing perspectives.

Participative - it seeks to involve different groupings and levels in an organisation, because the knowledge and resources needed to solve complex problems and implement solutions will be distributed around a number of individuals and groups in the organisation.

Integrative - on the assumption that the differences thrown up by the adversarial and participative processes must eventually be brought together again in a higher order synthesis, so that an action plan can be produced.

Managerial mind supporting - believing that managers exposed to different assumptions will possess a deeper understanding of an organisation, its policies and problems."

The methodology of SAST can be summarised as:-

(i) GROUP FORMATION - As many individuals as possible who have a potential bearing on the definition of the 'problem', and its proposed solution, should be brought together. This group is subdivided into smaller groups. These subgroupings are done with the aim to maximise similarity of perspective *within* groups and to maximise different perspectives *between* groups.

(ii) ASSUMPTION SURFACING - Each group then develops a preferred strategy/ solution, uncovers and analyses the key assumptions upon which its preferred strategy/solution is based. To this end 3 techniques are used:-

(a) Stakeholder Analysis - Identify the key individuals or groups on which the success or failure of the preferred strategy depend.

(b) Assumption Specification - Each group lists the assumptions it is making, in terms of the stakeholders, upon which the preferred strategy/solution depends.

(c) Assumption Rating - Assumptions are rated in terms of their (1) importance and (2) justifiability. A list of the highest rated assumptions is prepared.

(iii) DIALECTIC DEBATE - Each group then attempts to 'sell' its option in an uncritical presentation. After all presentations have been made, dialectic debate ensues in which the audience can question and criticise the options and assumptions.

(iv) SYNTHESIS - The aim of the synthesis stage is to achieve a compromise on assumptions from which a new higher level of strategy/solution can be derived. A list of agreed assumptions should be drawn up from which the improved strategy can be worked out.

3.5.2 CRITIQUE OF THE SOFT SYSTEMS APPROACH

Soft Systems Theory, in general, and SSM and SAST, in particular, seek utility in organisational and social problem situations. To achieve this both SSM and SAST are concerned to cope with ill-structured problems, or messes, at the strategic level. Both are opposed to tackling messes by the method of reductionism. Rather than attempting to identify and analyse systems in the real world, both approaches prefer to work with the different perceptions of systems that exist in peoples' minds. Multiple perceptions of

reality are admitted and explored. Values are included explicitly rather than being excluded (in theory) from the methodological process. The privileged role of experts in the systems approach is questioned. The aim in each case is to encourage learning so that an accommodation can be reached among participants involved with a problem situation. This is done via the stimulation of dialectic debate.

Three strengths can be identified. First, the incorporation of different viewpoints can lead to a richer understanding of the problem situation, expressing it in a way that will assist in the insightful choice of relevant changes [Jackson, 1991]. Particularly the 'rich picture' technique of SSM could be a fruitful method to achieve better understanding of a problem situation. Second, both SSM and SAST utilise the different views that always exist amongst managers to stimulate 'creative tension' that may lead to problem identification. Third, the main value of Soft Systems Thinking, lies in the support it offers to the practical interest in promoting intersubjective understanding. Both methodologies considered, offer effective means of securing and expanding the mutual understanding among individuals in social systems, whether through dialectic debate (SAST) or a cyclic learning process (SSM) [Jackson, 1991 : 168].

The main criticisms expressed by Jackson [1991] and Flood & Jackson [1991] can be summarised as indicating an **overcorrection** and an **undercorrection.**

First, Soft Systems Theory constitutes an **overcorrection** in terms of the traditional systems approaches. In their critique of the traditional (particularly the hard systems approaches) and their attempts to 'correct' this position, the interpretive thinkers tend to disregard the value of the cybernetic and hard traditions. In SAST there is no intention to address the control of natural or social systems. Checkland [1985 : 765] does acknowledge hard systems thinking as a 'special case within the general case of issues calling for accommodation', but Flood & Jackson [1991 : 187] disagree, calling such claims 'unjustifiable imperialism'.(1)

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(1) Jackson [1997] defines Methodological Imperialism as representing a fundamental commitment to one theoretical position but a willingness to incorporate other strands of management science if they seem to be useful and add strength in terms of the favoured position. Insights from other tendencies are integrated into the edifice of the favoured approach as long as they do not threaten its central tenets. He, however, dismisses Imperialism because methodologies and methods developed in the service of one theoretical position would be 'denatured' if used under the auspices of another.

Both SSM and SAST are predicated on very subjectivist and idealist grounds, giving pre-eminence to the self-conscious creating of social reality by human actors, the more objective elements are down played and thus Soft Systems Theory constitutes not an expanding of systems thinking, but rather an overcorrecting move away from the traditional to the soft approaches. Churchman, like other soft system thinkers, neglects objective features of social reality. The highly structured, resistant social world studied by functionalist and structuralist social scientists is foreign to him. Because of Churchman there are no objective aspects of social systems to worry about, bringing about change means simply changing the way people think about the world - changing their *Weltanschauungen*. But there are problems here. From the point of view of objectivist social science, worldviews are not so easily changed. They are closely linked to other social facts (political and economic) in the social totality. Changing worldviews may depend crucially on first of all changing these other social facts. If we really wish to bring about change, we need some understanding of the laws that govern the transformation of the social totality. Only then can the real blockages to change (which may not be in the world of ideas) be located and pressure applied. Burrell [1983] argues that Checkland always sees conflict as related to a clash of values and not to a difference in material interest. But the subjective beliefs of groups about their interests do not necessarily coincide with their objective interests. Permanent reconciliation of conflicts between stakeholders might need to be in terms of objective and not merely subjective interests [Jackson, 1991 : 165].

Second, the soft systems tradition constitutes an **undercorrection** in that it does not go far enough to address the problem of power and coercion in organisations. The interpretive philosophy seems to believe that, although differences in Weltanschauungen do exist, these are such that an accommodation is possible. Flood & Jackson [1991 : 188] are adamant:

"... Checkland cannot properly address issues of conflict and coercion. All conflict must apparently be of an ideological nature so that it can be removed by promoting mutual understanding. Coercion, brought about by power relationships, cannot be recognised at all..."

They have earlier [1991 : 134] criticised SAST for also not being able to handle situations where coercion exists. This leaves Soft Systems Theory with a limited area of applicability as organisational power and coercion are rife, in the opinion of Flood & Jackson and similar critical thinkers. Ulrich [1996], in particular, argues that the consensus at the end of a debate may not reflect the strength of the argument but simply various constraints on discussion, viz the result of unequal power resources, resulting in participants without a 'competent voice' being silenced. But it is not only critical

thinkers that emphasise power and its role in organisations. Pfeffer [1981] discusses the general existence and influence of power in organisations and identifies several theories that posit external control of individual behaviour [Pfeffer, 1982]. The Theory of Exchange argues that the behaviour of social actors are constrained by other actors because the latter controls resources or performance valued by the former. Thus, the behaviour of individuals becomes controlled externally when others have power over them, by virtue of resource control, and make requests for behaviour based on that power [Pfeffer,1982 : 83] or Role Theory posits as external constraints, compliance with group norms and role expectations in return for acceptance by the group and approval and resources from others in the individual's role set. Socialisation and social information processing, on the other hand, argue for informational social influence effects on individuals. People learn how to perceive things, how to make sense of things, and even what their preferences should be from those in their social environments. And, some of the effects of groups are informational in nature, such as providing information on the normatively acceptable rate of productivity and what attitudes are reasonable [Pfeffer, 1982 : 118].

A third aspect of critique is that both SSM and SAST seem to be based on the idea that solutions will flow from proper discussion of the problem. There seems to be an unwarranted assumption that once problems arising from the existence of different worldviews have been dissolved, then the difficulties stemming from nonhuman complexity of communication, control, and organisation will disappear as well. This Mason & Mitroff [1981 : 10] support the conclusion that every formulation of a wicked problem corresponds to a statement of solution and understanding a problem is synonymous with solving it. This is to miss altogether the daunting problems concerned with organising large-scale complex systems that are identified and worked upon in organisational cybernetics [Jackson, 1991 : 167]. The weakness of these methods to capitalise on their problem structuring strength with clear problem solving moments, have been recognised by Petkov & Mihova-Petkova [1996, 1997], suggesting that the complementary use of these methods with other problem solving methodologies may provide a fruitful way forward for soft systems thinking.

From this discussion it is clear that, although the soft systems thinkers, have made an important contribution to management, the shortcomings must be recognised and a framework defined that would utilise the strengths of Soft Systems Thinking and at the same time supply additional support in the areas of weakness.

3.6 COMPLEMENTARISM IN SYSTEMS THINKING

3.6.1 CRITICAL SYSTEMS THEORY

Having criticised both the traditional and soft systems approaches for each being limited to a narrow band of applications, an unifying approach has emerged with the work of Flood and Jackson (inter alia). This approach, called Critical Systems Thinking (CST) endeavours to bring together the various approaches. Jackson [1995 : 30] explains the approach:

"A particular organisational culture might, for example, determine use of OR or a cybernetic approach rather than soft systems thinking. An awareness of the strengths and weaknesses of the different systems methodologies, and of the social consequences of using each type, leads to the possibility of employing them in a pluralist or complementarist manner - each used when and where it is the most appropriate."

He continues by pointing out that not only are the selection and use of different methods important but the ethical implications of their use must be considered. He is particularly sensitive to the use of methods that could enhance power domination and coercion [1990 : 662].

Critical systems thinking is built on five major commitments [Jackson, 1995]:-

(i) Critical Awareness

Critical awareness in CST is of two forms: First, it closely examines the assumptions and values entering into actually existing systems designs or any proposals for a systems design. A second form of critical awareness concerns understanding the strengths and weaknesses and the theoretical underpinnings of available systems methods, techniques, and methodologies.

(ii) Social Awareness

It involves recognising that there are organisational and societal pressures that lead to certain systems theories and methodologies being popular at particular times and should make users of systems methodologies contemplate the consequences of use of the approaches they employ.

(iii) Human Emancipation

CST is dedicated to serve human emancipation by seeking to achieve for all individuals the maximum development of potential and raising the quality of life and work. This is CST's ethical stance [Jackson, 1995 : 30].

(iv) Complementarism At The Theory Level

The complementary and informed development of different systems approaches, expressing different rationalities stemming from alternative theoretical positions. These alternative positions must be respected.

(v) Complementarism At The Methodological Level

Critical systems thinking is committed to the complementary and informed use of systems methodologies in practice. The issue of complementarism forms an important aspect of our framework, and it is necessary to expand on this briefly. The term 'complementarism' as used here can be given in the words of Flood [1993 : 91]:

"Complementarism means that there are many different approaches to 'problem solving' but each has its strengths and weaknesses. Some are excellent at cybernetic prediction and control in achieving technical mastery, but fail to deal with issues of humans as social and political beings. Other methods have been developed focusing on the practical interest to generate learning and understanding but do not want to work out cybernetic blueprints for or diagnosis of organisations, and do not have the means of penetrating whose interests are being served. Approaches with an emancipatory interest can be developed to help to overcome coercive forces..."

Flood uses in this definition the term 'interest', this refers to his (and Jackson's) linking of complementarism to the knowledge constitutive interest theory of Habermas [Gibbens, 1985]. Habermas sees the two fundamental aspects of human interest as 'work' and 'social interaction'. From these interests, Flood & Jackson [1991 : 49] define two areas of intervention, ie:-

(i) Technical

Work reflects what we can call a technical interest in prediction and control over natural and social processes. To intervene successfully in this area methods are required that are of a more technical ('hard') nature.

(ii) Sociological

Work cannot happen without social interaction. We do not work in a vacuum. We are only able to work by communicating what is going on and to be able to operate our technical systems in co-operation with others. Developing understanding is clearly important in the workplace. Disagreement can be as much a threat to achieving goals and material well-being as failing to achieve technical mastery. This requires methods to clarify viewpoints and are of an interpretive ('soft') nature.

Building on Habermas' concern for the distortion of communication due to the coercive structures, Habermas beliefs, are active in societies, a third area of intervention is important:

(iii) Emancipatory

The exercise of power can prevent the free discussions necessary to achieve learning and understanding which in turn will hamper our technical abilities. We therefore have an emancipatory interest in achieving freedom from constraints imposed by power relations.

The reference to Habermas' work, not only links CST to the more general critical theory (of which Habermas is a leading exponent [Burrell & Morgan, 1979 : 294]; [Gibbens, 1985 : 123]), but also attempts to provide a theoretical, philosophical justification for complementarism. This link is, however, not without problems, and a brief critique will be given in 3.6.4 below.

3.6.2 SYSTEM OF SYSTEMS METHODOLOGIES

The complementarist approach is operationalised through the use of Total Systems Intervention (TSI) [Flood & Jackson, 1991]. The process employs a range of systems metaphors to encourage creative thinking about organisations and the difficult issues that managers have to confront. These metaphors are linked to various systems approaches through a framework, the System of Systems Methodologies (SOSM), first developed by Jackson & Keys [1984] and expanded by Jackson [1990], while at the same time criticising Keys for misinterpreting the original work. An ideal-type grid of problem contexts were produced.

This grid (Figure 3.1) uses two factors, one to indicate the complexity of the situation and the second to indicate the degree of 'consensus' regarding the objectives to be achieved. On the first axis problems are graded simple or complex. The distinction could be seen as indicating the ease with which the problem can be modelled. The second axis is divided into 3 areas; unitary, pluralist and conflictual. Unitary implies problems in which the objective is clear to all involved, while pluralist implies differences exist amongst the responsible and effected parties. The conflictual context also assumes different opinions and viewpoints, but unlike the pluralist context, where the possibility for consensus exists and are sought, the conflictual or coercive contexts, apparently, exclude the possibility for consensus. The grid, thus provides 6 problem contexts, simple-unitary (SU), complex-unitary (CU), simple-pluralist (SP), complex-pluralist (CP), simple-conflictual (SC) and complex-conflictual (CC).

	UNITARY	PLURALIST	CONFLICTUAL
SIMPLE	SU	SP	SC
COMPLEX	CU	CP	CC

Figure 3.1: Problem Contexts Grid

This grid is used to critically interrogate the assumptions made by different systems methodologies to uncover the basic assumptions underpinning the different systems approaches [Jackson, 1993]. Jackson [1990] points to various methodologies that could be used to address problems in the various contexts listed, Flood & Jackson [1991] expand on this, giving more detailed discussions on the various methodologies. For the current discussion it is important to note that they place the 'hard' methods as SU; socio-technical systems theory and contingency theory as CU; SAST as SP and SSM as CP [Flood & Jackson, 1991 : 42].

3.6.3 TOTAL SYSTEMS INTERVENTION (TSI)

Flood & Jackson [1991] postulate a meta-method, TSI, to guide the process of method selection and use, in a coherent fashion.

3.6.3.1 METAPHORS AS A WAY OF EXPRESSING SYSTEMS

To guide thinking about organisations and changes that might improve quality and organisational design, Flood [1993 : 86] has suggested that 5 systems metaphors be adopted. The five identified were: Machine, Organism, Brain, Culture and Political. The metaphors are used in a rational structured fashion within TSI. Viewing the organisation or problem through the various metaphors will give some insight about the main organisational issues to be dealt with. Important to remember is that the use of these metaphors is done from an **interpretive** standpoint, ie that systems are not real and do not actually exist. They are thoughts about reality raised and organised by systems metaphors.

3.6.3.2 TSI PHASE I : CREATIVITY

The first phase of TSI is that of creativity. This can be summarised as: thinking creatively about the problems that you face, listening to and incorporating other people's views [Flood, 1995 : 9]. The task during the creativity phase is to use systems metaphors as organising structures to help managers think creatively about their enterprises. The metaphors drawn upon by TSI are those identified in 3.6.3.1 above. The outcome that is expected to emerge from the creativity phase is a dominant metaphor which highlights the main interest and concerns and can become the basis for choice of an appropriate method. There may be other metaphors which it is also sensible to pursue into the next phase. The relative position of dominant and these dependent metaphors may be altered by later work and mixing of metaphors may be appropriate.

3.6.3.3 TSI PHASE II : CHOICE

The second phase involves that you choose a method, sometimes simple, sometimes sophisticated, that is judged to be the most likely to tackle the problems effectively. The task during the choice phase is to choose an appropriate systems-based intervention method (or set of methods) to suit particular characteristics of the organisation's situation as revealed by the examination conducted in the creativity phase. The tools provided by TSI to help with this stage is the critical analysis of the complementarist framework introduced in 3.6.2 above. The idea of complementarism, that there is utility in all well-thought-out approaches, is applied taking cognisance of the strength and weaknesses of different methods. The outcome of the choice phase is selection of dominant methods., to be tempered in use by the imperatives highlighted by dependent methods, particularly if several metaphors were found to be significant.

3.6.3.4 TSI PHASE III : IMPLEMENTATION

The task of the Implementation phase is to employ the chosen method(s) from the Choice phase to deal with problems surfaced by creative thinking. The chosen method(s) is/are used to develop and implement specific change proposals to tackle the core problems surfaced [Flood, 1995 : 9]. The tools provided by TSI are the methods used according to the logic of TSI. These include methods designed to achieve quality that will be chosen when issues concerning inadequate quality emerge. The methods operationalises the vision of the organisation contained in the dominant metaphor identified during the creativity phase. The outcome of the implementation stage is co-ordinated change made in those aspects of the organisation currently most vital for its effective and efficient functioning.

3.6.3.5 TSI : A CYCLIC PROCESS

TSI is an iterative meta-method. It asks, during each phase, that continual reference be made, back and forth, to the likely conclusions of other phases. This is a continuous process - a process of creative thinking, choice of method(s) and implementation of innovative change proposals worked out with the chosen method(s). This implies that each phase looks forward to the next one and back at the previous one [Flood, 1995 : 11].

3.6.4 CRITIQUE OF THE CRITICAL SYSTEMS APPROACH

Criticism of the Critical Systems approach and particularly TSI can be divided into two aspects, first, critique of the philosophical foundation of complementarism proposed and second, critique of TSI.

In 3.6.1 above, the fact that complementarism, as viewed by the critical systems thinkers., should be based on the knowledge constitutive interest theory of Habermas (cf [Jackson, 1990]; [Flood & Jackson, 1991] and [Flood, 1993]) was mentioned. Using Habermas' work in this way, was criticised by Tsoukas [1993] pointing out that Habermas' distinction between 'work' and 'interaction' is simplistic and that these interests are fundamentally, and inextricably, linked. This criticism is answered by Jackson [1993], by restating the grounding of TSI in Habermas, adding that TSI does, however, except that the various interests are linked, and continues [1993 : 291]:

"Positivist, interpretive, or emancipatory approaches would all misconstrue themselves if they believed they were the only legitimate approach to social reality or to the social construction of reality. They can, however, be seen as a complementary set of approaches if they are all employed in an informed manner according to their particular characteristics."

He returns to the critique of Tsoukas in a later article [1997 : 5], now accepting the criticism, points out that it is no longer tenable to believe, as TSI did, that paradigm incommensurability can be resolved by reference to some meta-theory such as Habermas' human interests. He favours the development of TSI so as to manage the critique 'between the paradigms' and not by control from 'above the paradigms', this he indicated would require further research [1997 : 6].

A full critique of TSI will not be attempted here. Some points need to be made, briefly, regarding the used of metaphors in TSI. First, Tsoukas [1993] criticises the use of metaphors in the Creative (Phase I) part of TSI on 4 points. Metaphors are first seen as redundant - as not aiding in the process of TSI - because the results reported by TSI users in case studies seem to be 'common sense' diagnosis that could have been obtained without the use of metaphors [Tsoukas, 1993 : 63]. In Tsoukas' opinion metaphors (and figurative language more generally) are useful heuristic devices in cases where unfamiliar phenomena are dealt with, but that in familiar circumstances, there is no cognitive necessity for the use of figurative language. The use of metaphors are secondly criticised as circular. Tsoukas argues that the use of a particular metaphor will always highlight that particular aspect of the problem situation because metaphors (figurative language) have an inherent quality of reciprocity; it is both descriptive and constitutive of reality. This leads Tsoukas [1993 : 64] to two further problems; the use of multiple metaphors will (by virtue of their reciprocitory nature) highlight multiple aspects of the problem situation but this will have no discriminatory powers because all aspects will be highlighted, and further, their is no way in which these metaphors and the problems they highlight can be prioritised to find the 'dominant' metaphor.

Jackson's [1993] answers to these criticisms can be summarised as follows: First, he points out that the metaphors are used not as cognitive devices because of unfamiliar terrain but rather as 'conceptual vehicles to view the problem area from a variety of points of view' [Jackson, 1993 : 291]. In this way the metaphors 'fit hand-in-glove with the complementarism of TSI'. Second, he argues [1993 : 292] that the circularity must be accepted because it is exactly the fact that a particular metaphor will 'throw up' its related issues that they are employed within TSI. Third, in terms of the discriminatory and prioritising power of the metaphors, Jackson [1993 : 292] argues that:

'... it does not mean that it is impossible to prioritise the issues revealed by such an analysis. In fact it is rare in practice ... for some issues not to come to the fore as needing more urgent attention".

These replies by Jackson do, however, still leave some questions unanswered. If the quote is analysed it does seem to depend on the phrase 'in practice'. This tends to imply that maybe Tsoukas' point, that it is really the TSI user (consultant) that does the discrimination and prioritisation [1993 : 65] and not the metaphors per sé, should be given serious consideration. If this could be confirmed, Jackson's [1993 : 292] argument, that the metaphors are used to prevent 'purveyors and enthusiasts of particular methodologies' to approach problems only from their favourite metaphor's perspective, is wrong. Using the metaphors, but then having to make a prioritisation judgement anyway, does not seem to eliminate bias and still predicates the process on the views of the consultant. The different metaphors highlight different aspects of the problem situation, but as Morgan [1986] indicates the normal organisational situation is a mix of all, or at least many, of the metaphors he suggests. Highlighting all these aspects may confuse rather than clarify the already complex problem. Add to this the reciprocity of figurative language and it seems warranted to investigate whether metaphors are the best way to guide the creativity phase of TSI, and if so, how analogies and metaphors can be conceptually developed so that they may yield scientific knowledge [Tsoukas, 1993 : 65].

Second, organisation theory has been dominated by sociology, so much so that organisation theory can be said to be synonymous with *organisational sociology* [Rawlinson & Procter, 1996]. Economists have increasingly become interested in some of the same issues as organisation theorists. In this regard it should be noted that no economic/financial metaphors are included in the list for TSI [Flood, 1993] (or in the more elaborate list of Morgan [1986]). This does seem to indicate that TSI takes a 'sociological' view of organisations to the exclusion of an economical one. Expanding TSI in this regard seems indicated and particularly the Transactions Cost Analysis approach of Williamson [1994] could be evaluated as a possible way forward.

3.7 MULTI-CRITERIA DECISION MAKING AS A SYSTEMS APPROACH

3.7.1 INTRODUCTION

An important criticism of the problem structuring methods of the Soft Systems Approach (SSM and SAST) was that they are weak in the choice and implementation

phases [Petkov & Mihova-Petkova, 1997]. An approach strong in these areas would, in complementarist fashion, help to enhance any framework used to achieve organisational learning and change. A multi-criteria decision making approach is now introduced to achieve this.

3.7.2 JUSTIFICATION OF LINKING MCDM AND SYSTEMS THINKING

Traditionally, multi-criteria decision-making (MCDM) theory, in general, and the Analytic Hierarchy Process (AHP), in particular, have not been seen as part of the mainstream systems thinking development. A recent review of the diversity of systems thinking [Lane & Jackson, 1995] makes no mention of AHP, and it is difficult to pinpoint any reference to it in the mainstream systems literature, particularly, not in the CST literature on which the current complementarist framework is built. Flood & Jackson [1991] do not include AHP, neither does Flood [1995] in his more comprehensive list of methodologies [Petkov & Mihova-Petkova, 1997].

There exist, however, important reasons for linking systems thinking and MCDM and Petkov & Mihova-Petkova [1997] point, with agreement, to the finding of Saaty & Kearns [1991] that AHP could be a promising and powerful tool in the study of systems. This conclusion is related to the hard systems thinking paradigm but it will be shown that AHP could also be used in the CST paradigm. Following the analysis of Petkov & Mihova-Petkova [1996 : 4] such a link would benefit both systems thinking and AHP; AHP because very little is done to highlight the relevance of systems thinking and cybernetics to the AHP modelling for systems with feedback, and soft system approaches because (inter alia):

"In our opinion AHP is stronger than Problem Structuring Methods since it not only provides means for supporting judgements but also for measuring them which is necessary for prioritising the issues in the intelligence and design stages of decision making.'"

First, justifying this link from the literature, provides only limited success. The work of Saaty & Kearns [1991] links AHP to hard systems thinking. Saaty [1990a : 5] compares the 'Deductive Approach' with the 'Systems Approach' and links AHP to the latter. The reference is short but seems to imply a general systems view. Madu & Kuei [1995 : 23] define TQM in terms of holism and argue that within such a systemic approach:

"It is therefore necessary that a multi-criteria decision framework be used to invigorate the stakeholders into making consistent and reliable decisions."

A second justification can be found in the area of shared application. According to a survey on the status of Multiple Criteria Decision Making the problems to which this group of techniques are suitable can be classified as 'messy' [Stewart, 1992]. 'Messes' are also the area of applicability of a range of systems approaches including SSM [Checkland, 1983 : 667]. That AHP seeks to address problems of complexity with highly interrelated aspects is also clear from the AHP literature [Saaty, 1990a]; [Saaty & Vargas, 1991]. Finally , linking AHP and systems thinking, particularly, soft systems thinking, is also indicated by several shared characteristics; different (opposing) perceptions and a learning process [McCarney , et al, 1997 : 28]; using both quantitative and qualitative data [Petkov & Mihova-Petkova, 1996 : 4]; and accepting subjectivity [Petkov & Mihova-Petkova, 1997 : 2].

3.7.3 DESCRIPTION OF MCDM

The successes of early OR/MS projects were at least partially due to the fact that they addressed operational problems, such as production scheduling and inventory control, for which more-or-less well defined objectives could be identified with little controversy. As the sphere of application of quantitative management science moved from these operational decision making situations to higher level managerial planning and decision making, well defined problems gave way to what we have referred to as 'messes'. One consequence of this shift is that decision making goals became increasingly imprecise. The key philosophical departure point defining Multiple Criteria Decision Making (MCDM) as a formal approach to types of problem solving lies in attempting to represent such imprecise goals in terms of a number of individual (relatively precise, but generally conflicting) criteria. Over the past two decades, MCDM has developed into a discipline in its own right.

3.7.4 DESCRIPTION OF THE ANALYTIC HIERARCHY PROCESS

The Analytic Hierarchy Process (AHP) was developed by Saaty in the seventies, and is a powerful and flexible decision making tool for complex, multi-criteria problems where both qualitative and quantitative aspects of a problem need to be incorporated. The AHP structures the important components of a problem into a hierarchical structure, reduces complex decisions to a series of simple comparisons and rankings, synthesises the results and provides for the calculation of inconsistency.

The various aspects of AHP methodology can be summarised as:-

(i) Hierarchy Structuring

The hierarchy model normally consists of at least 3 levels; (1) Goal to be achieved, (2) Criteria relevant to goal achievement and (3) Alternatives. The second level can be subdivided into sub-criteria clustered under 'parent' criteria if this better represents the problem under review.

(ii) Pairwise Comparisons

A matrix is created, containing the pairwise comparisons between each two elements of a given level of the hierarchy towards their contribution or influence over a factor from a higher level that is related to them. For this purpose a nine-point ratio scale is used.

The vector of priorities given as the normalised eigenvector of the matrix corresponding to its largest eigenvalue. These are local priorities, reflecting the importance of the elements, within a cluster, with respect to its root.

When more than one level is involved, hierarchical composition is used to weight the eigenvector by the weights of the criteria and the sum is taken over all weighted eigenvector entries corresponding to those in the lower level and so on, resulting in a global priority vector for the lowest level of the hierarchy. The global priorities express the importance of each element with respect to the overall goal of the Analytic Hierarchy Model.

(iii) Inconsistency Index

Saaty [1990a : 84] defines a measure called the consistency ratio as a ratio of the consistency index to the average consistency index of a randomly generated reciprocal matrix of the same order. The use of this ratio identifies those comparisons where a revision of judgement is necessary; this is done when the consistency ratio is > 0.1.

The Analytic Network Process (ANP), based on the Analytic Hierarchy Process, is an approach for the analysis, synthesis, and justification of complex decisions with the capability to model non-linear relations between the elements. ANP allows the decision maker(s) to leap beyond the traditional hierarchy to the interdependent environment of network modelling. The ANP is designed for problems characterised by the added complexity of interdependencies such as feedback and dependencies among problem

elements. Using a network approach makes it possible to represent and analyse interactions, incorporate non-linear relations between the elements, and synthesise mutual effects by a single logical procedure.

3.7.5 CRITIQUE OF MCDM/AHP

Schoemaker & Waid [1982] found, after an experimental comparison of five different techniques for determining weight in additive utility models, that the AHP was the easiest to use and the most trustworthy of the tested models. Peniwati [1996] evaluated several group decision making methods, including Voting, NGT, Delphi, MAUT and AHP, against 16 criteria and concludes that the AHP is the most comprehensive of these methods in structure, in analysis, in mathematical validity, and in its producing truthful results.

Several papers raise criticism of AHP's axiomatic foundations and so-called arbitrary rankings [Dyer, 1990]. Stewart [1992 : 575] is clearly negative about the usefulness of AHP as compared to, what he calls 'simpler procedures'. It seems that most of these problems become resolved when one does not try to apply the axiomatic foundations of other decision making theories to the case of AHP [Saaty, 1990b : 268] [Harker & Vargas, 1990 : 273].

When AHP is evaluated against the 4 stages of decision making, as proposed by Simon [1960]; (1) Intelligence, (2) Design, (3) Choice and (4) Implementation [Turban, 1995] the results are:-

(1 & 2) **Intelligence & Design Phases** - AHP is useful in these phases but the problem structuring, capabilities is the least formalised aspects of AHP. Here a complementary use of AHP with SSM should prove fruitful [Petkov & Mihova-Petkova, 1997].

(3) **Choice Phase** - It is claimed by Petkov & Mihova-Petkova [1996], that the sound support for the Choice phase by AHP is one of its strongest advantages when compared with the set of Problem Structuring Methods. AHP's validity in terms of the reliability of outcome is also rated high by Peniwati [1996].

(4) **Implementation Phase** - AHP supports the Implementation phase of Simon's model of decision making not just through the priorities that are derived in the Choice Phase but also through the possibility for multiple 'what-if' type of analysis of the influence on the final decision by a number of small changes in the assumptions guiding the decision.

Glueck & Jauch [1984], writing from a general strategic management perspective and not referencing paradigms as such, discuss various views on decision making and define three main styles: Rational-analytical, Intuitive-emotional and Political-behavioural. These styles seem to parallel the three paradigmatic perspectives; Functionalist, Interpretivist and Critical. Glueck & Jauch [1984 : 17] argue for a synthesis of these different styles, an argument which seems to be in line with our pluralist approach. They link AHP to this synthesis by pointing out that, although AHP is predominately an analytical approach, it includes many of the other elements, and from this Glueck & Jauch [1984 : 38] conclude:

"Perhaps, these techniques will help us overcome the problems associated with various decision styles."

Finally, the support given to group participation by AHP counts strongly in favour of this method.

3.8 SUMMARY

Various systems perspectives have been discussed, highlighting the traditional, soft and critical systems approaches. The Critical Systems Theory, with its complementary incorporation of aspects from both the traditional as well as the soft systems approaches was found to be best suited to the current TQM model. Linking the AHP to systems thinking was indicated to strengthen both AHP and systems thinking and provides the building blocks required for a framework for TQM implementation. The structure of this framework will be discussed in Chapter 4 and its implementation in Chapters 5 and 6.

CHAPTER 4
A FRAMEWORK FOR INTERVENTION

4.1 INTRODUCTION

In the earlier Chapters several TQM and systems perspectives were discussed. A framework to operationalise these perspectives and implement TQM must now be defined. The suggested framework is a complementarist approach combining elements from the two systems approaches (SSM and SAST) and an MCDC method (AHP). These methodologies were introduced, what remains, is to explicate; first, the compatibility of TQM and a systems approach and, second, the ways in which the methods, separately and collectively, address the important TQM and systems perspectives, thus establishing their suitability for a systems approach to TQM.

4.2 COMPATIBILITY OF TQM AND THE SYSTEMS APPROACHES

Having discussed various TQM perspectives in Chapter 2 and systems perspectives in Chapter 3, the links between these perspectives will be explicated to show how a systems approach will benefit TQM implementation. The TQM perspectives to which the systems approaches need to be linked are: (i) Integration; (ii) Participation; and (iii) Problem Solving. These three areas were shown (2.4 above) to make certain demands which, it was alleged, would require combination with perspectives from various systems approaches if TQM implementation was to be successful.

4.2.1 TQM, SYSTEMS AND INTEGRATION

The beneficiary link between TQM and systems thinking is found on two levels. First, TQM itself is conceptualised as a system, a whole with interdependent parts and, second, TQM views the organisation as a system in its environment.

Defining TQM as incorporating both quality management (ISO 9000) and environmental management (ISO 14000) in a single unit was suggested to require a systems approach, integrating the elements of both approaches into a coherent whole. A second aspect of integration related to the required simultaneous attention given to technical ('hard') and human ('soft') issues.

TQM is conceptualised in many different ways and models, often presented as the 'one best way of TQM' [Long & Vickers-Koch, 1995]. Conceptualised in this way, often with the use of one, or a few, preferred methods, is sure to limit TQM's application to complex issues. Issues like attempting to link economic growth and environmental protection (often seen as mutually exclusive); handling technical and human resource interventions, simultaneously; and balancing diverse stakeholder expectations and requirements.

TQM is, therefore, conceptualised here as a system of different change management philosophies, documented systems and a wide variety of change/improvement methodologies. It is accepted that different approaches have utility in different situations and that different methods or tools best address problems found in these different situations. In reality several issues, eg social, economic, environmental, political and technical should be given simultaneous attention in decision making and TQM is, therefore, conceptualised as the unifying whole (system) that integrates the different philosophies, approaches and tools (subsystems), relevant to the separate issues. CI and BPR were seen as applicable to different situations [MacLean & MacIntosh, 1997] but to be applied in tandem as 'part of a bigger picture effort' [Thompson & Strickland, 1995]. Hard engineering-like interventions were shown to be ill-suited to human activity systems [Checkland, 1981] while soft systems methods, on the other hand, were shown to be inappropriate for cybernetic problems [Flood & Jackson, 1991] and the 'mixing' of hard and soft approaches are advocated [Crossfield & Dale, 1991]. Finally, ISO 9000 was criticised as limiting creativity [Flood, 1993]. In the light of the multitude of approaches and techniques available and, importantly, the co-ordination that is required amongst these approaches, it seems appropriate to conceptualise several systems of philosophy and methods, each addressing the issues they are most suited for, unified (integrated) within a supersystem, TQM.

The suggestion that a systems approach may be appropriate for TQM implementation is not only useful as a conceptual model for TQM itself, but also in how the organisation is viewed from within TQM. Organisations, particularly large complex organisations, can be subdivided in many ways; different departments; line and staff functions; product quality and environmental issues; technical (hard) and human resource (soft) aspects. Which ever way this is done, the need for integration exists. Integration is then both the conceptual seeing of the interrelatedness of these 'divisions' and the practical management to maintain and improve the coordination between different 'divisions'. In terms of the TQM definition proposed in this thesis, integration of, particularly the quality (ISO 9000), environmental (ISO 14000), hard (technical) and soft (human

resource) aspects is important. Suboptimilisation was indicated as counter-productive [Ackoff, 1973, 1979a, 1981a, 1995]; [Caroselli, 1993]; [Dettmer, 1995] and should be avoided.

The principles of integration, holism and synergy was shown to be the central concept in all systems approaches, particularly in General Systems Theory (cf [Von Bertalanffy, 1950]; [Katz & Kahn, 1978]; [Ackoff, 1981]; [Smit & Cronjé (ed), 1997]; [Mullins, 1996]). The principles of integration, seeing interrelationships between elements, holism and synergy were shown to have been the very reasons for the formulation of the GST in opposition to analytic, 'machine age' thinking. Systems approaches, thus, provide ideal conceptual models for visualising TQM and organisations in an integrated way.

A caveat must, however, be raised. In linking the systems approaches to TQM note must be taken of the fact that the systems approaches provide a conceptual framework for integration but do not provide practical guidelines of how this it to be accomplished. A particular problem is related to the application of certain open systems theory principles to organisations. The integration and coherence of subsystems within a social system is conceptualised, from a functionalist perspective, using the organic system analogy. Seen this way systems tend to 'automatically' attain homeostasis, or internal coherence and integration, with subsystems naturally working together for the good of the total system. Silverman [1970] criticises both Parsons and Katz & Kahn for doing just that. By applying the organic analogy to strictly, Silverman argues, the functionalist open systems thinkers tend to believe that it is a systems imperative that internal conflict will be handled by the 'built-in' capabilities of systems to attain homeostasis. Organisations may be systems but they are not natural systems [Silverman, 1970] and given the purposive action of individual actors, who may have personal interests in conflict with the interests of the organisation, the constant process of integration must be actively managed and not assumed to happen automatically [Slack, et al, 1995].

Linking TQM and a systems approach, specifically in terms of integration and holism, is advocated widely. This is clear, first, from the TQM perspective, seeing the value of systems thinking for TQM (cf [Deming, 1989]; [Badiru, 1990]; [Roth, 1991]; [Grahn, 1995]; [Dettmer, 1995] and [Carruthers, 1996]) and, second, from the systems thinkers, presenting systems ideas as ideal conceptual vehicles for TQM (cf [Flood, 1993]; [Helzer, 1994]; [Mulej & Rebernik, 1994] and [Loeckenhoff, 1994]). The link between Environmental Management and the Systems approach is evident from Elohim [1994]; Stuhler [1994]; Welford [1995]; Madu & Kuei [1995] and Cascio [1996] inter alia. All these authors argue that organisations must include environmental management into their strategic and quality management activities and that this would require systemic

and holistic approaches. Integrating 'hard' (technical) and 'soft' (social) issues is not only an aspect of the proposed TQM definition, but also enters the domain of the socio-technical systems theory and it comes as no surprise to find the link between STS and TQM being made (cf [Manz & Stewart, 1997]; [Linscheid, 1994] and [Dean & Bowen, 1994]).

The utility of various systems approaches to ensure integration in TQM implementation is not only clear but, according to Ackoff [1995]; and Jackson [1995], essential. Both these authors claim that not using a systems approach to ensure 'whole' system integration is one of the main reasons for the failure of many TQM programmes.

4.2.2 TQM, SYSTEMS AND PARTICIPATION

The full participation of employees not only in the TQM system, but importantly also in the design and improvement of the system, was seen as critical. Any methodology included in the framework must, therefore, be measured against its capability of involving the relevant stakeholders in the process and providing these stakeholders with the means of presenting their various perceptions and expectations. The solution to a complex problem, like the integration of ISO 9000 and ISO 14000 into a TQM programme can only be solved with the participation and empowerment of all stakeholders. Their involvement can best be achieved in a framework for organisational learning. The question then can be formulated as whether the system approaches will facilitate this participative learning process in the transition to TQM.

Churchman [1968] places different viewpoints and contributions at the heart of systems thinking. This argument was carried forward by the soft systems thinkers, particularly Checkland [1983] and Mason & Mitroff [1981]. The interpretive paradigm underpinning soft systems thinking is presented as an ideal vehicle for the real involvement of the widest spectrum of stakeholders, by allowing various viewpoints (weltanshauungen) to surface and inform the learning (continuous improvement) process [Roos, 1996a]. Fishman [1997 : 3] is quite adamant that organisational learning can **only** take place within, what she calls, 'advanced systems theory' and says that this:

"... heralds the potential for a conceptualisation of learning that transcends functionalism and allows for the emergence of creative capacity inherent within a holistic, interpretive framework."

Spencer [1994] links TQM and the interpretive approach (cultural model), but unlike Fishman, maintains the value of the functionalistic aspects of the hard and open systems approaches for TQM. Flood [1993] links TQM and participation with viable systems theory, sociocultural (interpretive) systems theory and critical (emancipatory) systems theory. Particular stakeholders that need to be involved are suppliers and customers (quality management) and the community (environmental management). These groups are external to the organisation and as such part of the **environment**, in systems terms. Proper involvement of such external roleplayers is clearly in line with open systems theory [Spencer, 1994] and with contingency theory [Sitken et al, 1994]. The involvement of external stakeholders, of environmental issues, are linked to open systems theory by Madu & Kuei [1995]. The utility of various strands of systems thinking for TQM implementation via participation and empowerment is thus indicated [Jackson, 1995].

The links between organisational culture and participation were introduced earlier (2.3.3.2 above). The importance of a culture conducive to participation was indicated for TQM [Dale & Cooper, 1992] but, simultaneously, the problem posed by various interpretations of what culture is and whether it helps or hinders participation, was mentioned. Setting a framework for TQM implementation should consider these aspects carefully, because the link between participation and culture cannot be seen as unproblematic. Organisational culture is seen as intimately related to learning and change [Shein, 1994] and is indicated, serving both as inhibitor or facilitator of organisational learning. Shein [1994] indicates several characteristics of a culture that would enhance learning and facilitate improvement, including; A concern for people, in the form of equal concern for all stakeholders; shared commitment to open and extensive communication; shared beliefs that teams can and will work; and the ability to think systemically by accepting the interconnectedness of economic, political and socio-cultural events. Another approach to culture, sees culture as a form of managerial control [Robbins, 1989 : 470] acting as a substitute for formalisation; governing the day-to-day behaviour in the workplace by rule definition [Deal & Kennedy, 1983 : 501]; providing the key to corporate financial success [Peters & Waterman, 1982] and high morale and smoothly coordinated task performance [Schein, 1985]. Moreover it is assumed that managers can manipulate or shape the organisational culture to enhance performance and gain the advantages mentioned [Spencer, 1994]. Juran [1991 : 84], for example, argues that quality management often requires a 'good deal of cultural change', which can only be accomplished through the active and personal leadership of top managers. In this regard Dailey [1990 : 201] argues that it is 'generally agreed' that an organisation's culture depends heavily on the role of the chief executive and he uses Lee Iacocca of Chrysler as an example. Martin & Frost [1996] group authors of this orientation under the rubric of the *Integration Perspective* and indicate that this approach

has come under severe critical attack from the *Differentiation Perspective* [Martin & Frost, 1996 : 603], in which the 'unitary' emphasis of the former view is replaced with a more 'pluralistic' view, defining culture as a nexus, where environmental influences intersect, creating a nested, overlapping set of subcultures within a permeable organisational boundary [Martin & Frost, 1996 : 604]. They distinguish two schools within the Differentiation Perspective, viz an Interpretative as well as a Critical orientation [Martin & Frost, 1996 : 605]. The latter is concerned with the working lives of relatively low status workers and is congruent with a relatively leftist political ideology that challenges top management's views and control. This latter critique was referred to above, when the use of culture, to enhance TQM, was criticised as a masquerade of Taylorism [Dean & Bowen, 1994] and as a more oppressive form of control than hierarchy [Cascadden, 1997b]. Martin & Frost [1996 : 610] propose a complementarist meta-theoretical approach, arguing that elements of all three perspectives can be identified in any one organisational culture and thus, any culture at any point in time will have some aspects congruent with all three perspectives. Spencer [1994] argues for an interpretivist culture model for TQM, particularly, giving due cognisance of the different (constructed) views of employees. Managers must not only reinforce viable symbols of quality but also listen carefully to diverse participants in order to understand their varied interpretations. Interpretative theorists believe that employees negotiate meaningful contributions and have a voice in establishing organisational goals and system parameters [Spencer, 1994 : 464]. Here, the problem that participation is not always free of coercion and that everybody does not necessarily have 'a competent voice' [Ulrich, 1996] must be heeded from a Critical perspective.

Participation, and particularly a culture to enhance participative processes, must be seen as important for a framework to implement TQM but of similar importance is the approach to base such a participative culture, not in functionalist (managerial) principles only, but to utilise, in addition, principles from both the Interpretivist and Critical perspectives, a clearly, pluralist/complementarist approach.

4.2.3 TQM, SYSTEMS AND PROBLEM SOLVING

It was shown that the two perspectives discussed, above, have the consequence that decision making will be multi-criterial. The combination of quality and environmental management will necessitate complicated trade-off management [Manning, 1988]; [Petkov, et al, 1998] in terms of time and other resources, while participation brings in its wake a complicated web of multiple perceptions, views and expectations. The integration of ISO 9000 and ISO 14000 was shown to be a 'messy' problem where the

relations between the different goals, focuses and stakeholders of these two approaches require simultaneous multi-criterial management [Petkov, et al, 1998]. A framework for TQM implementation should, therefore, be capable of supporting complex multi-criteria decision making, in a problematic ('messy') situation. The link between MCDM and systems thinking was explicated in 3.7.2 above. The link between MCDM and TQM is made by Madu & Kuei [1995] when indicating that within a systemic approach to TQM, multi-criterial decision making is essential and by Saaty [1992] and Forman [1998] who both link AHP to several TQM elements and applications, including Benchmarking.

A caveat should be raised on the emphasis placed on systems problem solving. This emphasis could be seen as a view *rejecting* reductionist problem solving techniques in favour of a 'superior' systems approach. It must be clearly stated that the Critical Systems Approach is seen as relevant to the current problem, viz the introduction of ISO 9000 and ISO 14000 Management Systems as a process towards TQM, but that, within a TQM programme, several improvement efforts (particularly on process or engineering systems) would require the appropriate reductionist approaches.

4.3 ELEMENTS OF THE FRAMEWORK

Three methodologies were suggested in Chapter 3 for inclusion into the framework. These methodologies must now be evaluated in terms of both the TQM and systems perspectives discussed above to establish their suitability for inclusion in a framework for a systems approach to TQM. The same three aspects, used to evaluate the TQM/Systems link, will be used. Because the aspects of Integration, Participation and Problem Solving were seen to be critical, the ability of various systems methodologies should be evaluated in terms of these criteria.

4.3.1 SOFT SYSTEMS METHODOLOGY

4.3.1.1 SSM AND SYSTEMIC INTEGRATION

SSM is clearly systemic, in actual fact SSM is doubly systemic, in Checkland's view [1985 : 764], because:

"It is itself a cyclic learning process; and it uses systems models within that process."

Flood & Jackson [1991] place SSM in the problem contexts grid under Complex-Pluralist (CP), thereby indicating its suitability to complex systemic situations. This apparent agreement between SSM and TQM must, however, be placed in perspective. The 'systems view' often advocated in TQM is based on functionalism, ie the search of 'systems in the real world'. Interpretive thinkers, like Checkland, are adamant that this is an impoverished position as compared to their view of using systems as models. Compare Fishman's [1997] argument that organisational learning can only take place within an interpretive framework. Interestingly, Spencer [1994] shows that TQM contains elements of both the mechanistic and organismic models of organisations and thereby indicates that TQM orthodoxy is functionalist. She, however, continues to show that, although not enough, some TQM elements do compare to the interpretive *culture* model of organisations. This shows a way forward for TQM towards a more interpretive, subjectivist paradigm.

4.3.1.2 SSM AND PARTICIPATION

SSM is a suitable approach to promote organisational learning through encouraging stakeholder participation in problem solving. The element of active participation is stated by Flood & Jackson [1991 : 171]:

"The interpretive grounding of SSM leads very strongly to the principle of participation. This is so important that we might go so far as to say that, without guaranteed participation of those involved, any application of SSM must be invalid in its own terms."

SSM also agrees with the multiple perspectives view of TQM by accepting that many simultaneous interpretations of the same human activity system exist [Wilson, 1990 : 31] and provides, through debate and communication, a process to support the incorporation of these views and expectations in decision making.

4.3.1.3 SSM AND PROBLEM SOLVING

SSM was shown to be applicable to complex, 'messy' problems [Flood & Jackson, 1991] and in this respect ideally suited to the framework. However, one of the criticisms levelled at SSM was the lack of support, given by SSM, in the choice and implementation stages of decision making [Petkov & Mihova-Petkova, 1996]. This is the reason for the suggested approach of complementing the problem analysis phase with a multi-criteria decision making approach like AHP.

4.3.2 STRATEGIC ASSUMPTIONS SURFACING AND TESTING

4.3.2.1 SAST AND SYSTEMIC INTEGRATION

SAST sees problems as 'wicket' [Mason & Mitroff, 1981] and attempts to address these problems of organised complexity. From this it would seem appropriate for the framework. Flood & Jackson [1991 : 133] are, however, critical of this aspect. In terms of the systemacy, they agree that SAST does assume systemic complexity in problems and differing viewpoints, but this refers only to the 'pluralism' aspect of the problem contexts grid and does not imply that SAST is useful when the complexity stems from the system rather than the participants. In the transition from ISO 9000 to a combined ISO 9000/14000 system this weakness of SAST must be acknowledged and supplemented by methodologies (eg SSM) to address the complexity introduced by the 'system' of TQM.

4.3.2.2 SAST AND PARTICIPATION

Participation was shown to be one of the four basic principles underlying SAST and the methodology thus seeks to have utility in situations where diverse opinions and assumptions exist, believing that dialectic debate is the way to highlight these differing viewpoints. There are, however, concerns that coercive and other situations in organisations may frustrate the participative principle [Flood & Jackson, 1991 : 134], and that SAST is thus only applicable to simple-pluralist contexts. In such contexts it can assist in structuring the exploration of different world views and help to bring about a synthesis, or at least accommodation, among participants so that action can be taken. The enormous number of stakeholders, both internal and external, often present practical difficulty in applying all the stages of SAST. Further, the participating stakeholders may not always be classified as adversaries and their debate as a dialectic one. For this reason the brainstorming component of SAST can be used separately as a creativity supporting technique [Petkov, et al, 1998].

4.3.2.3 SAST AND PROBLEM SOLVING

Although SAST acknowledges the multiple criterial aspect of problems, it attempts to be useful in problem formulation and structuring rather than problem solving. In this respect it exhibits the same weakness, identified for SSM, of inadequate support for decision making.

4.3.3 ANALYTIC HIERARCHY PROCESS

4.3.3.1 AHP AND SYSTEMIC INTEGRATION

The links between AHP, TQM and systems thinking have largely been dealt with under 3.7.2 above. The agreement between TQM and AHP regarding their multi-criteria nature is obvious. Similarly has the agreement regarding the systemic nature of AHP been addressed. Particularly important was the aspect of trade-off decision making to achieve integrated, holistic balance between different (conflicting) requirements. Forman [1998] lists several uses of AHP within TQM, these include inter alia, evaluating customer requirements, benchmarking and process improvement by enhancing Pareto and Ishikawa diagrams. Saaty [1992] points to an IBM report, attributing their success in achieving the Baldridge Award to a system including both benchmarking and AHP. Madu & Kuei [1995] link AHP to TQM in terms of trade-off management in strategic and quality decision making.

The links between AHP and systems thinking were dealt with in general terms but the position of AHP in terms of the Problem Contexts Grid had not been made explicit. Petkov [1997] indicates that the AHP can handle both relatively simple or very complex situations and could, therefore, be seen as relevant to both the simple and complex contexts.

AHP is, thus, ideally suited for inclusion into a framework to address the complex, systemic nature of TQM. The simultaneous incorporation and prioritisation of quality and environmental objectives, often conflicting, were shown to be a critical aspect of TQM. AHP, thus, forms an important part of the framework to operationalise the amalgamation of ISO 9000 and ISO 14000 into a TQM system.

4.3.3.2 AHP AND PARTICIPATION

The AHP also ensures participation by providing just the mechanism for the expression of different perceptions or views. In this regard it is claimed to be even stronger than the soft systems approaches, because it provides a mechanism to preserve anonymity, thereby enhancing the free expression of opinions [Petkov & Mihova-Petkova, 1997 : 4]. The support afforded, by AHP, to the problem structuring methods in this regard, lends support to the view of using these methodologies in a complementarist framework [Glueck & Jauch, 1984]. The link between TQM and AHP is useful in prioritising customer requirements, process capabilities and stakeholder views for both quality and environmental management [Madu & Kuei, 1995].

Linking AHP to the Problem Context Grid, Petkov & Mihova-Petkova [1997] indicates that different procedures available, allow priorities to be aggregated whether the team members largely agree or even strongly disagree on the subject, making AHP relevant to all three the contexts; unitary, pluralist and coercive. As far as the last is concerned, using AHP in concert with SSM could minimise its relevance to coercive contexts if the adamant criticism of Jackson [1991] and Flood & Jackson [1991] on SSM's inability to address coercive situations are taken as correct. The complementarist linking of SSM and AHP, rather than negating the power of AHP, may well result in the strengthening of SSM in coercive situations.

A particular aspect of participation was mentioned earlier (2.2.3.2 above). The problem of empowerment and participation is often perceived as undermining management authority with the possible loss of effectiveness due to lack of clear direction and goals [Cascadden, 1997b]. Petkov [1994] argues similarly that a decision making framework should ideally be capable of imposing some systemic constraints on decisions in accordance with the views of top management and, on the other hand, to allow actual decision making to take place at the lowest management levels. This top-down management policy deployment and simultaneous bottom-up participation processes could be achieved by using the AHP [Petkov, 1994 : 1192].

4.3.3.3 AHP AND PROBLEM SOLVING

The strength of AHP in the choice and implementation phases of decision making [Forman, 1998] is the most important reason for inclusion of AHP in a framework for TQM implementation, as this is the weakness of SSM and SAST. AHP's applicability to 'messy' problems of complexity strengthens its utility in such a framework.

4.4 ANALYSIS AND JUSTIFICATION OF THE FRAMEWORK

The framework structure can be analysed in terms of two aspects:-

4.4.1 COMPLEMENTARISM

The suggested framework is based on critical complementarism and it should be analysed and justified in terms of this perspective. A complementarist or pluralist approach to management was introduced earlier (3.6 above). Three aspects require further attention; first, a critique of pluralism; second, the specific link between TQM and pluralism and third, the structure of such a complementarist approach. The use of a complementarist framework is not unproblematic. Complementarism is both stoutly defended and severely attacked. The critique of complementarism, or pluralism, will be discussed from two perspectives; *intra*-paradigm pluralism and *inter*-paradigm pluralism.

In intra-paradigm pluralism the case is that of debate between different approaches, methodologies and models sharing paradigmatic common ground. This debate is considerable [Burrell & Morgan, 1979 : 24] and seems to pose no problem to complementarism. The use of methodologies sharing a common paradigmatic framework seems unproblematic and is often advocated. Katz [1970 : 17] stresses the simultaneous use of both the 'elemental' (hard systems approach) and the 'systemic' (open systems approach), both functionalist [Burrell & Morgan, 1979 : 124]. This is also the case of Contingency approaches advocating that there is no 'one best way to manage' and that the use of mechanistic and organismic forms should be used dependent on the degree of uncertainty in the environment [Smit & Cronjé, 1997], as such the mixing of hard and open systems is not seen as problematic, on the contrary, in the analysis of Burns and Stalker [Burns, 1963] most organisations are seen as differing mixes of organic and mechanistic forms anyway [Mullins, 1996 : 379].

Criticism of complementarism, in the form of *inter*-paradigm pluralism, was raised by Tsoukas [1993]. To him the mutual unintelligibility of different systems of thought is paramount. He points with agreement to Burrell & Morgan [1979 : 25], who define their 4 paradigms as 'mutually exclusive', and to Winch [1958]; criticises complementarism from a Wittgensteinian perspective [Tsoukas, 1994a] and by using Pepper's World Hypothesis Framework [Tsoukas, 1994b]. This view agrees with the incommensurability thesis of Kuhn [Barnes, 1985].

Arguments **for** pluralism, on the other hand, abound. Hassard & Pym (Ed) [1990] take their lead from the study by Burrell & Morgan [1979] and argue that the field of organisational studies poses a plurality of competing paradigms that need to all be explored; Morgan [1990] suggests that paradigm diversity represents an 'opportunity' rather than a 'threat' for organisational research. He argues that we need to harness the possibilities raised by different paradigms in order to yield the rich and varied

explanations offered by multiple paradigm analysis. This is also reflected in his [1986] list of diverse metaphors. Anderson & Reeves-Ellington [1995] similarly argue that the complexity of the global organisational environment requires praxis research utilising several different paradigms. They particularly link the use of these diverse paradigms to TQM, Continuous Improvement and Supplier/Customer relations. The theme of theoretical heterodoxy is also at the heart of the argument by Martin [1990] to break up the mono-method monopolies and harness the value of multiple paradigms. Willmott [1990] advocates to go 'beyond paradigmatic closure in organisational enquiry' and criticises one of the key premises of the Burrell & Morgan [1979] scheme - that of the dualism of subjective and objective paradigms. He explores the possibilities for reconciling what Burrell and Morgan regarded as the irreconcilable features of their paradigms. Roos [1996a], Luckman [1996] and Lyles [1996] argue separately that pluralism is abundant in the world and that this should be reflected more in organisational studies and interventions. Müller-Merbach [1994] argues for a methodological pluralism of different systems approaches. Cascadden [1997a] proposes a synthesis between positivism and interpretivism in educational administration. The management literature is full of contradictory claims of what works and what doesn't [Shapiro, 1997]. Such contradictory claims point toward the fact that there is utility in adopting a broad (complementarist) view instead of a narrow (one-best-way) perspective. Within the systems approach of Churchman [1968] this is a systems imperative - no single viewpoint or opinion contains the complete truth. There are many approaches to the study and understanding of organisations, each has value, each is incomplete and complementary views will be better than any single view [Churchman & Emery, 1966]. Jackson [1997] gives several reasons for adopting a pluralist approach, one of which is the apparent move towards the proliferation of pluralist approaches in practice.

A full evaluation of the debate on pluralism cannot be dealt with here, what must be stressed is that this debate highlights that both **dangers** and **advantages** exist when adopting a pluralist approach. Serious cognisance of **both** these aspects must be taken when implementing a pluralist framework.

Using a pluralist framework for TQM implementation requires that the links between pluralism and TQM be explicated. TQM orthodoxy was shown to be functionalist [Spencer, 1994], this applies both to the mechanistic and organismic versions of TQM [Manz & Stewart, 1997] and is clear from the writings of TQM proponents, seeing 'real systems in the world' (cf [Deming, 1989]; [Grahn, 1995] and [Dettmer, 1995] inter alia). The ISO 9000 and 14000 standards are also clearly functionalist, mechanistic systems of regulation and control. Using these standards to build a TQM system would strengthen the functionalist nature of TQM.

Mention was made earlier of Fishman [1997] and Roos [1996b] who claim that organisational learning and continuous improvement (both concepts very closely related to TQM [Ryan, et al, 1997]) cannot be achieved in a functionalist approach but only within approaches predicated on the interpretive paradigm. Cattrell [1990] argues similarly that environmental research and education require an interpretive approach. Hart [1990] suggests a critical approach in environmental research, pointing out that the critical paradigm most closely aligns with the 'ecological worldview'. Welford [1995] posits true ('deep') environmental management opposite, what he calls, a 'mechanistic' view 'hampered by the limitations of current scientific knowledge'. Although he does not clearly spell it out the argument seems to be for a more interpretive systems approach.

Scholars who accept the interpretive view might reject TQM because it is a functionalist ontology and would, in their view, be incapable of adequately capturing the full essence of human organisations. Particular aspects of this 'full essence' include; (i) that organisations consist of individuals with free will who can pursue their own goals; (ii) individuals who enact or socially construct the organisation, its environment and their roles within it; (iii) proper attention to the diverse stakeholder requirements; and (iv) adequate culture changes. From a critical perspective, TQM can be criticised for often not taking cognisance of power domination and coercion [Flood, 1993]; [Jackson, 1995].

Spencer [1994] argues that, although TQM is predominantly informed by the mechanistic (hard systems) and organismic (open systems) models, the cultural (soft systems) model must also be used to provide diverse analogues for explaining the management of organisations and highlight different issues concerning the practice of TQM. She indicates that some academics may have ignored TQM as a management practice because it does not fit neatly into any one paradigm [Spencer, 1994 : 460] but that accepting this multi-paradigmatic nature of TQM should provide interesting ground for management research [Spencer, 1994 : 468]. Sitkin et al [1994 : 541] agree pointing out that TQM involve both control and learning and that these epistemologically incompatible approaches should coexist synergistically to improve effectiveness. They suggest that managers should overcome this apparent paradox by using the two complementary forms of TQM together. Guillén [1994] indicates that TQM is an eclectic model, including elements from the scientific management, human relations and structural analysis models. Flood [1993] argues that TQM can only be fully practised if the sociocultural (soft) systems approach and the critical (emancipatory) approach coexists with control elements from the viable systems model.

The necessity of multi-paradigmatic pluralism in TQM is thus indicated.

A third aspect of the TQM/pluralism discussion involves the requirements for a coherent pluralist framework. Following Jackson [1997], three requirements can be identified:-

(i) Pluralism must encourage flexibility in the use of the widest variety of methods, models, tools and techniques. In particular the decomposing of methodologies should be allowed, to ensure that, where applicable, methods and tools normally associated with a root methodology may be used separately or in conjunction with other methodologies [Mingers & Gill, 1997].

(ii) Pluralism must be multi-paradigmatic and methodologies from different paradigms must be used together unless good reason exists to temporally relapse into imperialism. Maintaining a multi-paradigmatic focus will provide the richest perspectives on the problems facing management and the introduction of TQM.

(iii) Pluralism will mean living with, and managing, a degree of paradigm incommensurability. This requires the use of a meta-method, like TSI, to inform the choice of methods. The methods chosen should be critically evaluated in terms of their utility and the assumption underpinning their use.

The need for a complementarist framework, both as a conceptual vehicle to frame pluralist thinking on TQM and as a practical tool in selecting multiple methodologies for TQM implementation was introduced. The Critical Systems Theory was presented as a possible way forward because of its acceptance of complementarism at both the theoretical (conceptual) and methodological levels [Flood & Jackson, 1991].

4.4.2 PROBLEM STRUCTURING AND PROBLEM SOLVING

In line with a pluralistic approach a practical framework for method evaluation is required. The four stages of decision making as proposed by Simon [1960] are presented as such a conceptual framework for method evaluation. These stages can be grouped (Stages 1 and 2 - Intelligence and Design) under the term *Problem Structuring* and Stages 3 and 4 - Choice and Implementation - as *Problem Solving.* Using Simon's model the relative strengths and weaknesses of the different systems methodologies suggested, were evaluated.

The starting point in problem solving is not the solution, but the problem formulation. Burgess [1979] encourages managers to work hard at proper formulation of the problem before attempting any solution. This, he indicates, should take place by interpretive/ participative enquiry involving all stakeholders. The structuring of messy problems are best done by using the interpretive methodologies of SSM and SAST, either as whole methodologies or using selected aspects of them, because of their strengths in allowing participation and different viewpoints to be used to identify stakeholders and provide a rich description of the problem situation.

It is generally believed that life is so complicated that to solve real problems we need to think in a complex way, taking full cognisance of the complex, interrelated, factors in decision making. The problem structuring methods were shown to be weak in this respect. The strength of AHP in this area is utilised, therefore, minimising the weakness of SSM and SAST, to implement specific multiple objectives, decisions and actions toward TQM. Thus the lack of focus in the decision process, a feature often criticised in SSM, is avoided. On the other hand the findings of the brainstorming session and stakeholder identification (SAST) as well as the utilised elements of SSM help in the problem formulation stage of AHP as that is assumed to be the least formalised stage of AHP [Petkov, et al, 1998]; [Petkov & Mihova-Petkova, 1997].

4.5 RESEARCH METHODOLOGY USED IN THE FRAMEWORK IMPLEMENTATION

The research project is based on the action research approach and incorporates several data source techniques. A short explication of the different approaches and techniques are given below.

4.5.1 ACTION RESEARCH

Action Research is a form of qualitative research and has become increasingly prominent in research involving the study of organisations [Eden & Huxham, 1996]. The term, *action research*, is often used rather loosely to cover a variety of approaches [Chein, et al, 1948], but normally embodies research which broadly results from an involvement by the researcher with members of an organisation over a matter which is of genuine concern to them and in which there is an intent, by the organisation members, to take action based on the intervention. The role of the researcher therefore changes to one of observer/participant during the action research. Action research is thus

concerned with the development of *behaviour* that may contribute to the transformation of an organisation toward greater effectiveness [Reason, 1994], while at the same time providing *research* output that meets the dual requirements of rigour and relevance [Eden & Huxham, 1996].

Action research is mainly characterised by three aspects:-

(i) Action research demands some direct involvement by the researcher in an attempt to change the organisation. Action research is concerned with intervening in action, and it is not enough for the researcher simply to study the action of others. Action research is linked to Organisation Development [French & Bell, 1984] and the terms are sometimes used synonymously and as if action research is solely about organisational change [Eden & Huxham, 1996].

(ii) However, action research must be seen as more than just changing a particular organisational setting, as it has implications beyond those required for action or generation of knowledge in the domain of the project. It must be possible to envisage talking about the theories developed in relation to other situations. It must also be clear that the results obtained could inform other contexts and it is through careful characterisation and conceptualisation of these experiences which has impacts on the theory that is carefully drawn out of the action research.

(iii) Historically, action research is linked to both the interpretivist paradigm [Reason, 1994] and to socio-technical systems theory [Eden & Huxham, 1996]. Action research therefore allows for differing viewpoints and perceptions as well as having links to systems theory. Participatory Action Research (PAR) [Fals-Borda & Rahman, 1991] is a particular branch of action research and is predicated on the critical paradigm, that seeks to present an alternative to the monopoly of knowledge and power held by the 'experts' [Ulrich, 1996] from which, it is claimed, ordinary people of all societies are excluded. PAR is not exclusively research oriented, that it is not only adult education or only sociopolitical action. It encompasses all these aspects together as three stages, or emphases, which are not necessarily consecutive. They may be combined into an experiential methodology, that is, a process of personal and collective behaviour occurring within a satisfying and productive cycle of life and labour. This experiential methodology implies the acquisition of serious and reliable knowledge upon which to construct power, or countervailing power, for the poor, oppressed and exploited groups and social classes - the grassroots - and for their authentic organisations and movements [Fals-Borda & Rahman, 1991]. The final aims of this combination of liberating knowledge and political power within a continuous process of life and work are: (1) to

enable the oppressed groups and classes to acquire sufficient creative and transforming leverage as expressed in specific projects, acts and struggles; and (2) to produce and develop sociopolitical thought processes with which popular bases can identify [Fals-Borda & Rahman, 1991]. The link between PAR and Critical Systems Thinking is made by Ulrich [1996].

The reasons for following an action research approach in this research can be found in several similarities between these characteristics of action research and the intervention under study, summarised as follows:

First, the organisation under study is busy with a process of change in which definite improvements are sought by introducing ISO 14001 in addition to the existing ISO 9002 system. The similarity with the transformational *(action)* aspects of action research is self-evident. Second, the particular organisational setting and change process provides an ideal opportunity to test a theoretical framework which could have possible utility in similar processes. This framework is based on several theoretical arguments and operationalising the framework provides an opportunity to apply a research approach which demands evaluation of theory and which provides a vehicle for theory elaboration and development as an explicit objective of the research process. Action research upholds an interest in both process and structure; in how a phenomenon works, as well as whether it works; and how both theory and practice can be improved [Rapoport, 1987].

Furthermore, interventions in organisations provide ideal opportunities for experimentation in the sense that opportunities to explore complex theoretical *frameworks* are possible which cannot be separated in the controlled evaluation of individual theories. This is important in organisation studies research where it is often the systemic nature of an uniquely interlocking set of theories from many disciplines that makes the body of theory powerful and useful. Action research is, therefore, important because it addresses *systemic relationships*, rather than just single theories. The aim is to understand conceptual and theoretical *frameworks* where each theory must be understood in the context of other related theories [Eden & Huxham, 1996]. The current framework is just such a systemic framework incorporating several related but different theoretical assumptions and action research therefore seems to be the ideal perspective for testing the theoretical soundness of this pluralist framework in a real organisational setting.

4.5.2 DATA SOURCES AND TECHNIQUES

Data and information were sourced using several qualitative and quantitative techniques. These techniques include:-

(i) Surveys

This quantitative technique [Hutton, 1990] was used to gather data both using externally designed and copyrighted surveys [Hall, 1987], as well as specific, new survey instruments [McEwan, 1998a, 1998b]. Survey research constitutes a major element in the history of organisational development, particularly the work of Rensis Likert, [French & Bell, 1984] and is ideally suited to the current research project because it provides a procedure for operationalising a systemic perspective at the levels of both individual and groups of actors..

(ii) Interviews

Although structured interview data was obtained, the majority of interview data used was obtained via the used of unstructured interviews. Unstructured interviewing provides a greater breadth than structured interviewing, given its qualitative nature [Fontana & Frey, 1994]. Differences between structured and unstructured interviewing exist because the former aims at capturing precise data of a codable nature in order to explain behaviour within pre-established categories, whereas the latter is used in an attempt to understand the complex behaviour of actors without imposing any 'a priori' categorisation that may limit the field of inquiry.

(iii) Participant Observation

The methodology of participant observation is appropriate for a wide range of scholarly problems pertinent to human behaviour. It focuses on human interaction and meaning viewed from the insider's viewpoint in everyday life situations and settings. It aims to generate practical and theoretical information formulated as interpretative theories. The methodology of participant observation involves a flexible, open-ended, opportunistic process and logic of inquiry through which what is studied is continuously subject to redefinition based on field experience and observation. Participation observation is generally practised as a form of case study which concentrates on in-depth description and analysis of some phenomenon or set of phenomena. Participation is a strategy for gaining access to otherwise inaccessible dimensions of human behaviour. Direct observation and prior experience of the field setting are primary forms and methods of

data collection, but the researcher may also conduct interviews, collect documents, and use other methods of gathering information. Participant observation is appropriate for a wide range of problems, especially when the meanings people use to define and interact with their ordinary environment are regarded as central issues. Although especially useful for exploratory and descriptive research purposes, participant observation results in generalisations useful for forming new theories as well as testing existing ones [Jorgensen, 1989].

Use of participant observation as an data gathering technique was employed in the current project for several reasons. First, the researcher was a member of the organisation's management team and consequently had direct access to the organisational setting not only as an observer, but also had direct responsibility as a participant for the change process from ISO 9002 to a combined ISO 9002/14001 system. Second, the views and interpretations of the organisation's managers within the actual change process were of essential importance to the research. The framework is based on the changing of an organisation via a process of learning, and the viewpoints of the organisational members are of paramount importance. The combination of participant observational data with other data sources was seen as necessary to capture the full richness of the situation. The researcher therefore had to avoid any attempt to observe the behaviour of fellow managers in a detached, covert, so called 'value-free' way, but had to take an active, transparent role in the process instead.

4.5.3 JUSTIFICATION OF MIXING QUALITATIVE AND QUANTITATIVE APPROACHES

The simultaneous use of several research approaches and data sources is a complex and problematic activity. A full discussion of the issues involved will not be attempted here, but a short justification is presented, highlighting the reasons for the pluralistic approach in this case.

Resistance to the use of qualitative methods is still found in journals and publications predicated on positivism [Stablein, 1996] so much so that it is often expedient not to emphasise the qualitative data underlying research if publication is intended [Sutton, 1996]. Qualitative approaches are often seen as less 'scientific' than the preferred quantitative methods [Denzin & Lincoln, 1994] and research using the former approach is consequently undervalued. The first problem in mixing qualitative and quantitative research methodologies lies in the ascribed 'superiority' of quantitative methods and the assumed 'inappropriateness' of qualitative techniques.

A second problem with a multiple methods approach is presented by Guba & Lincoln [1994] who note that, although the mixing of both qualitative and quantitative techniques within a paradigm (eg positivism) is justified, the mixing of paradigms is more problematic [Cantrell, 1994]. In a similar vein, Williams [1976], adopts a Symbolic Interactionist point of view in criticising Denzin for assuming that different methods produce different *views* and for justifying an eclectic use of multiple methods in this way. For Williams [1976 : 125], different methods produce different *worlds* and as such should not be used together.

On the other hand, arguments *in favour of* method mixing are found, first in a 'neutral' way by authors who simply list both quantitative and qualitative methods in discussions of their research findings (eg [Stablein, 1996]; [Jorgensen, 1989]) and, second, in a 'positive' way with authors arguing specifically for the use of both categories (eg [Cantrell, 1994]; [Denzin & Lincoln, 1994]; [Eden & Huxham, 1996]; [Martin, 1990]; [Mouton & Marais, 1990]; and [Strauss & Corbin, 1994]).

The different viewpoints parallel those discussed above in the paradigm pluralism discussion. As was mentioned above a full discussion falls outside the context of the current research project. The utility of critical pluralism, in which critical reflection is used to inform method choices within the framework and in the research on the framework, is advanced, providing the advantages and drawbacks of this pluralistic approach are given due consideration.

4.5.4 TRIANGULATION

Researchers ought to accept as a general principle that the inclusion of multiple sources of data collection in a research project is likely to increase the reliability of the observations. Denzin coined the term *'triangulation'* to refer to the use of multiple methods of data collection [Marais & Mouton, 1990], although the technique was actually developed and described earlier by Cattell [1952]. This concept relates to the use of a variety of methods which, as a result of their complementarity, may be employed to correct for their respective shortcomings. It is important to bear in mind that specific types of data collection are designed for the acquisition of certain types of data. For different types of information there is a prototypical method of data collection: the use of surveys for information concerning incidents, and the use of informants or interviews for information on norms and status. Each method has specific limitations. By employing different methods of data collection in a single project the researcher is, to

some extent, able to compensate for the limitations of each. Triangulation of research data thus refers to the method of checking their validity by approaching the research question from as many different perspectives as possible and employing redundancy in data collection [Denzin, 1989]. The principle is that if different research approaches lead to the same conclusions the validity of those conclusions is increased. A comparison with the triangulation process surveyors use to check a sequence of measurements from several points provides a clear analogy for this research process. Triangulation plays an important role in understanding uncertainty in interpretation or measurement.

In short, Triangulation provides a practical rationale for a multi-method approach to research. Denzin [Eden & Huxham, 1996] provides a comprehensive argument for the use of multiple studies where each study acts as a cross-check on the others, enhancing the process of developing reliable conclusions. Denzin [1989] also argues for triangulation to be applied in five aspects of the research; viz at the methodology, data, investigator, theoretical, and multiple triangulation levels in the field study.

Triangulation to check the validity of data is as important in action research as in other forms of research. However, action research *also* provides an uniquely different interpretation of the concept of triangulation. Exceptionally, action research provides an opportunity to seek out triangulation between (i) the *observation* of events and social processes, (ii) the *accounts* each participant offers, and (iii) the changes in these accounts and interpretation of events *over time.* From *these* three perspectives *the data are not expected to triangulate* (agree). Indeed, the researcher may be more surprised if they do agree than if they do not, given the deliberate attempts at discovering multiple views. This procedure underlines the possibility of multiple, alternative perspectives on how organisations are and might be [Eden & Huxham, 1996]. Importantly a lack of triangulation can act as an effective source for the generation of new concepts. The focus is therefore on what could be rather than what is. Thus triangulation has a different significance for action research compared with using triangulation only as a cross-checking method on traditional/classic scientific research.

4.6 SUMMARY

The TQM perspectives of Chapter 2 and Systems perspectives of Chapter 3, were linked resulting in the presentation of a theoretical framework, based on a complementarist use of several systems approaches. The utility of this framework was tested in a real organisational setting, using an Action Research approach. The empirical results of the implementation of this framework will be presented and analysed in Chapter 5.

CHAPTER 5
DESCRIPTION AND ANALYSIS OF THE FRAMEWORK IMPLEMENTATION

5.1 INTRODUCTION

This chapter presents a description and analysis of an action research based implementation of the framework introduced in Chapter 4. Chapter 4 presented a discussion on the research methodology, describing not only action research, but also the other research techniques used in the study. A short critique of both quantitative and qualitative research approaches in one research project was given. This chapter describes the project by placing it in an organisational context and historical process. Several problems experienced earlier as well as anticipated new problems are discussed as requiring the use of a new framework. The framework presented above is assumed to have utility in overcoming these problems and its implementation is both an attempt to advance the process and an opportunity to research the success of this particular framework in overcoming anticipated problems. The chapter concludes by describing the various workshops and data sources used to implement and research the framework. The data is presented throughout the chapter in the form of tables and figures which are analysed as appropriate.

5.2 CURRENT SITUATION AND ANTICIPATED PROBLEMS WITH THE INTRODUCTION OF TQM

5.2.1 THE ORGANISATIONAL CONTEXT OF THE RESEARCH

Mondi Ltd is one of the two largest forest products manufacturing and distributing companies in South Africa. The South African economy is characterised by an oligopolistic structure in which numerous companies are privately owned by a handful of large Multi-National Corporations. In Mondi Ltd's case, the principal shareholders include Anglo American Industrial Corporation (AMIC) with a 52 % shareholding, Anglo American Corporation of South Africa (AAC) with 31 %; and the remaining 17 % owned by De Beers Consolidated Mines (DBCM). Mondi Ltd is, in turn, a large international company with shareholder funds exceeding R3.8 billion in 1996/7. The company

pursues a diversified strategy and operates various subsidiaries with interests in forests, timber products, paper, cartonboard, recycled paper, and Kraft liner board. Mondi Ltd's international interests include a 20 per cent stake, with AMIC, AAC, DBCM and Minorco SA Ltd, in an independent subsidiary, Mondi Minorco Paper Company Ltd, which owns a 12 per cent stake in Aracruz Corp (Brazil), 50 per cent in Franschach GmbH (Austria), 49 per cent in Neusliedler GmbH (Austria) and 50 per cent in Aylesford Newsprint Ltd (United Kingdom).

Mondi Kraft, a division of Mondi Ltd, owns three paper mills in South Africa, which are active at Felixton, Piet Retief and Richards Bay, KwaZulu-Natal, where the largest mill is situated. This mill is the subject of this case study. An important international forest products company, Mondi Kraft Division produced 625,000 tonnes in 1996/7. This comprised 230,000 tonnes bleached hardwood pulp, 160,000 tonnes brown top Kraft liner board, 110,000 tonnes white top Kraft liner board and 125,000 tonnes of fluting. Approximately two-thirds of total output was produced at the Richards Bay Mill. Despite economic sanctions in the pre-1994 Apartheid era, the Division established a substantial export market which currently accounts for about 50 per cent of total output. Mondi Kraft employs more than 1 500 people of which just over 950 are at the Richards Bay Mill, performing not only mill specific functions, but also several divisional activities which are located on the Richards Bay site. The researcher is part of the Mondi Kraft Divisional management team, reporting to the Divisional Technical Manager, and is responsible for the maintenance of the ISO 9002 Quality Management System (QMS) and the introduction of ISO 14001 Environmental Management System (EMS) within the three mills of the division.

The Mondi Kraft, Richards Bay mill, needs to be described, further, from an environmental impact perspective, as follows:

Mass production technology for processing forestry products into pulp, or Kraft liner paper is generally standardised around the world which means that companies like Mondi Kraft have to contain similar sources of environmental pollution at Richards Bay to paper mills located overseas; namely, gaseous, liquid and solid waste emissions. Gaseous emissions include low levels of total reduced sulphurs, mecapthans and dimethyl sulphide into the atmosphere. Probably the only indication the general public has of these emissions is the unpleasant smell associated with paper mills; and although the plant is situated 10km away from the main residential areas in Richards Bay the odour problem is a major environmental concern to the Mill. However, all malodorous

gaseous emissions are collected and incinerated in the lime kiln or standby incinerator before emission into the atmosphere, to ensure compliance with quality specifications. Chlorine and Chlorine dioxide emissions are treated in a sodium hydroxide (NaOH) scrubbing process in the chlorine emission stacks.

The two main liquid emissions are Lignin and Organic Halides. The first, lignin, is extracted from the wood during digestion. The majority of this lignin is burnt as fuel in the Recovery Boiler, but a small fraction enters the effluent and darkens its colour. The effluent is treated using clarifiers where the solids are removed, which are returned to the Recovery Boiler as organic fuel. Organic Halides (AOX), which occur due to chlorine being used in the bleaching process, has been claimed to be carcinogenic in large quantities. The permit conditions under which the Richards Bay mill operates, require that the organic halide load in the effluent is reduced to below toxic levels. One way of achieving this, is by replacing chlorine with chlorine dioxide in the Bleaching process, this ensures that effluent complies with international standards achieved by similar Kraft processes overseas, before being diluted and pumped out into the sea off Richards Bay.

Solid waste emissions occur as ash from the coal-burning boilers and electrostatic precipitators controlling dust emissions from the recovery and power boiler stacks. Until recently, solid waste was discharged as landfill on a marshy site owned by a neighbouring company. However, building is due to commence soon and the site will no longer be available, so a search for alternative uses of ash has been commissioned by Mondi Kraft. One possibility is the production of cheap bricks which could help reduce the severe housing shortage among South Africa's disadvantaged communities, although less than 5 % of the ash is currently used to manufacture alternative products.

5.2.2 IMPLEMENTING TQM : ISO 9002 CERTIFICATION

A clear strategic direction was given by Mondi Ltd senior management when the Richards Bay plant was commissioned in 1984, which was aimed at meeting international quality standards. This policy was regularly revised and restated by the company chief executive at successive Mondi annual Management Conferences. By 1990, there was a clear commitment by management to ensure that current quality standards were being independently evaluated by the South African Bureau of Standards (SABS) and Bureau Veritas Quality International (BVQI) as part of ISO 9002 certification. Debate in several organisations since the mid 1980s centred round the

question as how best to achieve and demonstrate that high quality standards were being achieved. This included the possibility of either following the views of the quality gurus, which became better known during the early 1980s [Holmes, 1992], or to adopt some form of certification standard. The British BS 5750 was available and ISO was in the process of promulgating its version of this standard. In South Africa the SABS had published their own standard, based on BS 5750 as SABS 0157. The ISO 9000 family of standards, incorporating the three certification standards ISO 9001/9002/9003 and the accompanying guidelines ISO 9004, were first published in 1987. The popularity of these latter standards, particularly among Mondi's European customers, motivated management to adopt the ISO 9000 strategy. A directive to proceed with documenting quality systems which complied with the ISO 9002 standard was issued in 1990, with the aim of ensuring that certification was achieved before the end of 1992.

The necessary training, documentation and auditing were implemented and the Mill was certified for compliance with ISO 9002 : 1987 in September 1992. The system has been maintained and improved and was successfully re-certified against the revised ISO 9002 : 1994 in 1995. The directive authorising the system development required the system to be kept as simple as possible. Speedy and successful certification was set as a goal and only aspects directly required by ISO 9002 were included. ISO 9002 requires a system that specifies, controls and documents the activities and personnel 'directly involved in quality'. This leaves scope for the exclusion of aspects which are not seen as directly quality related. An example, discussed earlier, shows that ISO 9002 applications often ignore human resource management aspects, while only addressing training because the latter is an ISO 9002 requirement (§4.18), while the former is not [Kalinosky, 1990]. This was presented as a general example but, in fact, the exact situation occurred at Mondi Kraft. Departments within the Mill can be divided into basically three cohorts:

(i) **Full ISO** - Several departments, including Production, Quality Control laboratories, Warehousing and Despatch, are classed as 'full ISO 9002' because all personnel and activities within these areas are documented as part of the ISO 9002 QMS.

(ii) **Semi-ISO** - In certain departments a split occurred at section level whereby, for example, the Human Resource Department includes both Human Resource Management functions (not required to be included in the ISO 9002 QMS) and the Training Section which was included into the ISO 9002 QMS. A similar split is found in the Finance Department where financial and accounting functions are excluded, whereas Materials Management - a section within the Finance Department - is included

into the QMS because of the requirement that raw materials and maintenance spares are controlled as part of an ISO 9002 QMS.

(iii) **Non-ISO** - A few departments at the mill have no involvement in the QMS at present. These include several Engineering functions, Loss Control and Information Systems departments.

5.2.3 IMPLEMENTING TQM : TOWARD ISO 14001 CERTIFICATION

Mondi Kraft, Richards Bay mill had been operating, and improving, environmental risk minimisation equipment and systems since its inception in 1984. With the success of ISO 9000 standards worldwide, the development of a similar ISO standard for environmental management systems ensued [Vander Linden, 1997]. Even before the final standards were promulgated it was clear to management that progressing along the ISO 14001 route would also be advantageous. The decision to start developing formal EMS based on the British BS 7570, which was assumed would be the format adopted by ISO in their final standard, was taken in 1995. The similarities between the ISO 9000 and ISO 14000 standards were such that the possible integration of these systems presented itself. The researcher was given the remit to investigate the practical and theoretical implications of such integration. The process to develop a documented EMS in compliance with ISO 14001 has just been started with a target for certification set at the second half of 1999.

5.2.4 ANTICIPATED PROBLEMS ON THE WAY TOWARD TQM

Several problems were experienced during the original implementation process of ISO 9002 during 1990 to 1992. When the introduction of ISO 14001 was contemplated an opportunity occurred to investigate these problems and particularly those that could be anticipated to re-occur during the ISO 14001 introduction unless a new implementation strategy was adopted. These problems had been discussed before by Mondi managers but no formal evaluation was undertaken. The researcher attempted to formalise these evaluations to establish a set of problem statements that could be used formally to establish a new implementation framework, and evaluate the effectiveness of this framework in the process of moving toward TQM.

5.2.4.1 METHODOLOGY TO IDENTIFY AND RATE ANTICIPATED PROBLEMS

Four managers (all directly involved in the original ISO 9002 implementation process) were requested to join the researcher in a 5 member group to investigate the problems experienced during ISO 9002 implementation. Group members were asked to contribute their views of problems experienced during the ISO 9002 implementation that would need consideration in the ISO 14001 process. These views were received as unstructured comments and collated for presentation as a list of statements. The 5 members were asked to rate the statements on a 5-point Likert scale with a low value (1) indicating the statement as representing an operational problem, while a high score (5) would indicate that the issue was seen as non-problematic. Each statement was rated, in terms of whether it represented a problem experienced during the original ISO 9002 implementation and, second, whether it was anticipated as remaining problematic in the ISO 14001 process. A summary of the findings appears below:

5.2.4.2 RESULTS

Five of the problem statements recorded low *average* scores which indicate they are considered as problematic issues in respect to the implementation of ISO 9002/14001 systems.

(i) External (Compliance) Focus To Drive TQM Implementation

The problem rated most problematic (Average rating = 1.2) was the view that the ISO 9002 implementation was virtually exclusively driven by a top-management directive to comply with the Standard. The internal benefits to the company (eg cost reduction) were not stressed. This problem was further rated as high in anticipation of ISO 14001 being introduced (Average rating = 1.4). It was generally concluded that if the external pressures to obtain ISO 14001 certification were not balanced against *all the likely* benefits to the company, then implementation of the ISO 14001 standards could be severely hampered.

(ii) Participation In And Ownership Of The System

The problem of low participation in and ownership of the system was also rated problematic (Average rating = 1.4). Three contributory reasons for the low participation were emphasised; first, the use of external consultants; second, very severe time

constraints; and third, the fact that ISO 9002 was a virtually unknown Standard at the time to the majority of Mondi employees. This problem was rated high in anticipation of ISO 14001 introduction (Average rating = 2.4). It was generally perceived that both the use of consultants and the setting of severe time limits would hamper ISO 14001 certification. On the other hand, the fact that ISO 9002 is now known widely throughout the company was seen as a benefit to the ISO 14001 process (Average rating = 4.6).

(iii) Prevailing Culture And Systems Undervalued

The problem of undervaluing the prevailing systems and culture at the time of ISO 9002 introduction was rated as problematic (Average rating = 2.2). Two contributory causes, the use of external consultants and restricted time constraints, caused the ISO 9002 System to be imposed without adequate regard for the views and perceptions of company managers and employees at the time and without adequate prior discussions to facilitate mutual understanding. This problem is anticipated to remain problematic in the ISO 14001 process if the system is similarly 'forced' in (Average rating = 2.4).

(iv) Resistance To Change

The problem of resistance to the changes required for ISO 9002 was rated problematic (Average rating = 1.4). Three contributory causes, namely the use of external consultants; very severe time constraints; and personal attitude toward 'new' things, were identified. This problem is expected to remain problematic in the ISO 14001 process (Average rating = 2.2).

This problem is closely linked with the previous one, in that the way in which the system was introduced, without due attention to the existing culture and systems, increased resistance to change to a system seen as being forced onto Mondi by 'outsiders'.

(v) Multiple (Conflicting) Objectives

The problem of balancing the conflicting objectives of product volumes and quality was rated as problematic (Average rating = 1.6). This problem is anticipated to remain problematic in the ISO 14001 process (Rating = 1.8) when balancing volumes, quality and environmental issues are involved. The members of the 5-man group perceived that for any TQM framework to be successfully introduced, the balancing of these seemingly conflicting objectives must be taken into account.

5.2.4.3 DISCUSSION

From these results, and the main problems highlighted as needing attention, the required criteria to be included in a new framework to implement ISO 14001 along with ISO 9002 can be summarised as follows:

(i) A Holistic Focus To Drive TQM Implementation

A narrow focus was shown to be a problem in ISO 9001 implementation. In this case, the only driving focus was the pressure from certain European customers to achieve certification as soon as possible. Several other benefits of a documented QMS can be shown to exist. One such aspect is that of cost benefits. Slack, et al [1997] identify seven cost factors at the operational and strategic levels in organisations which need to be evaluated before ISO 9002 procedures can be successfully transformed into an effective TQM policy. To achieve this standard at an Operational level, Prevention, Appraisal and Internal Failure costs must be assessed, whereas at the Strategic level, the costs of External Failure, Unclear Management Strategy, the degree of Top Management Support and Socio-Political issues must also be known [McEwan, et al, 1998].

Introducing an EMS along with an existing QMS would complicate the issue and ensuring a broad systemic focus to drive the introduction therefore seems to be warranted. In the past, economic growth and environmental protection were seen as mutually exclusive. In modern manufacturing companies, however, there is a growing pressure to emphasise both. Regulations exist, especially in the area of environmental protection in most developed countries and in other places, including South Africa. This has been labelled by some authors as a process of Ecological Modernisation. The concept of Ecological Modernisation is understood as an integration of economic modernisation and environment protection for the purpose of getting a synergistic effect [Petkov, et al, 1998]. Management scientists have recognised for some time the importance of promoting research efforts on environmental protection and planning. Considerable research has been implemented in the area of environmental science as well, and a number of the approaches applied in these fields considers only environmental issues. In reality, there are also other issues, eg social, economic, political and technical, that cannot be ignored in any managerial decision [Petkov, et al, 1998]; [Welford, et al, 1998].

The achievement of acceptable environmental standards depends on similar Cost/ Benefit considerations as apply for quality. Welford & Prescott [1994] identify six cost areas, three in evaluating an environmental strategy at the company level; namely, the costs of Operational and External Failures, and Future Threats to the organisations; and a further three costs in achieving Sustainable Development as a Company Response; namely, the costs of Environmental Management at the local plant level, Strategic level; and their Auditing as a source of Competitive Advantage [McEwan, et al, 1998].

From the problems experienced during ISO 9002 implementation of a limited focus and the anticipated intensifying of the problem when ISO 14001 is introduced along with the existing QMS, it is expected that the first requirement set for the introduction of a suitable framework is that it should be able to allow various benefits of a TQM programme to all stakeholders to inform the process and act as a focus for ensuring effective implementation.

(ii) Participative Approach

During the ISO 9002 process participation was limited to a few managers mainly due to the severe time limits and the fact that ISO 9002 was an unknown entity. This low participation level and the use of external consultants resulted in a low degree of real ownership of the system. The procedures and work instruction were seen as belonging to Quality Assurance and often as having been 'forced' on the different operating sections. In introducing an ISO 14001 framework, management must take cognisance of this problem and provide a vehicle for a wide, open and full participation to ensure ownership and commitment to the EMS. The first task associated with the problem will be to identify all those that have a role to play, and then to provide these stakeholders with the opportunity to participate fully in the process [Petkov, et al, 1998]. The approach must also ensure that the different participants are given a 'competent voice' [Ulrich, 1996] in the process.

(iii) A Multiple Viewpoints Approach

Introducing a system like ISO 9002 without accommodating existing views, cultures and perceptions was found to be problematic, which is sure to be a problem in introducing ISO 14001. A framework should be found that values different viewpoints and is capable of achieving progress by harnessing these perceptions rather than suppressing them. A TQM programme involving both quality management (ISO 9002) and environmental

management (ISO 14001) would involve a greater variety of stakeholders and stakeholder views than a QMS only and reconciliation of these views is therefore important. Reconciliation is influenced by various stakeholders, including government, through the environmental legislation and taxation; society, through market demand and political 'lobbying' and non-governmental organisations, which are able to influence members of society in a particular direction. ISO 9002 and ISO 14001 standards may therefore be viewed as protecting society's interests, mainly through market forces and/or government regulations [Lamprecht, 1997]. However, a countervailing view is sometimes raised in Third-world countries, and in South Africa, where the pursuit of ISO 14001 standards is complicated by stakeholder relationships which, in terms of the System of Systems Methodologies [Jackson, 1991], vary between the 'pluralistic' and the 'coercive', given the intransigent attitudes of some parties. For example, widespread perceptions exist in South Africa that environmentalists are anti-development and anti-people according to the Executive Director for World Wide Fund for Nature [Hanks, 1996]. The challenge is to find ways of persuading society, particularly in provinces like KwaZulu-Natal where the paper mill is located, and where 60 per cent of the population live below the World Health Organisation minimum poverty-level, that the complex interactions between poverty, human population growth and economic development do not necessarily militate against sound environmental protection practices [McEwan, et al, 1998].

(iv) Overcoming Resistance To Change

A framework capable of overcoming resistance to change would probably have to include a process of organisational learning, aimed at changing the mind-sets of the relevant stakeholders involved [Petkov, et al, 1998].

(v) A Multiple Objectives Approach

The rationale for a systemic framework in the paper mill is to identify and evaluate factors with origins in the implementation of ISO 9002 standards which also have to be developed as essential propositions in the introduction of ISO 14001 international environmental management standards, as follows:

- Production facilities must operate profitably for orders to be repeated.
- It is essential to respond to market demands relating to price and quality.
- Compliance with environmental regulations is also critically important.

The two sets of standards therefore have different foci and different customers. ISO 9002 can be credited with improving the quality and accountability of exchanges between contracting parties (ie, between a firm and its suppliers, or between a firm and its customers). ISO 14001 improvements are often seen as more nebulous, since they seek to manage an organisation's relationship to its neighbours and to ecosystems in general. There are opposite views of the profit potential of the two sets of standards [Petkov, et al, 1998], which will have to be reconciled. This problem was identified for ISO 9002 and the 5 member group agreed that introducing ISO 14001 along with the existing QMS would demand increased attention to reconciling conflicting goals and objectives.

5.2.5 INITIATION OF THE FRAMEWORK IMPLEMENTATION

The researcher, supported by his two supervisors, approached Mondi Kraft Management during mid 1997 to present them with a theoretical multi-method framework that was intended to address the different anticipated problems. Mondi Kraft management was asked to adopt this framework, and it was stressed that the exercise would have a valid practical importance, in presenting the change of attitudes towards problems within the various groups of mill employees, which is a primary precondition of successful implementation. On the other hand, this novel research project would also be testing a new approach towards the pluralistic use of techniques from different methodologies in a given managerial intervention [Jackson, 1997]. Approval was given to start an action research project which utilises a framework, incorporating elements of SAST, SSM and AHP, for research purposes in a practical organisational context, while simultaneously providing Mondi Management with a change process towards the adoption of TQM.

5.3 THE FIRST WORKSHOP - NOVEMBER 1997

5.3.1 INTRODUCTION

A two day workshop was conducted with twenty representatives of the higher levels of the mill on 25 and 26 November 1997. The main purposes of this workshop were to:

(i) Initiate the changing of attitudes and a process of organisational learning.

(ii) Create common understanding of ISO 14001 amongst the stakeholders.

(iii) Identify and prioritise some of the main issues regarding ISO 14001 implementation.

(iv) Introduce the methodologies of SAST, SSM and AHP to managers.

(v) Suggest AHP hierarchies to support the introduction of ISO 14001 along with ISO 9002.

The managers involved were selected by the researcher to represent not only a diverse cross-section of different functional areas but also a cross-section of different levels of management. The participating managers, their titles and grouping are shown in **Table 5.1.**

TABLE 5.1 : FIRST WORKSHOP TEAMS

Area	Top Management Team	Middle Management Team	Lower Management Team
Production	Mill Manager Production Manager	Chem. Plant Manager Paper/Board Mill Manager	Process Engineer P&R Environmental Technologist
Technical / Laboratories	Technical Manager	Services Manager	Process Chemist
HR/Training	Sen. H R Officer	Manpower Training Manager	Manpower Development Officer
Finance		Financial Accountant	Senior Buyer: Overseas
Marketing	Commercial Services Manager	Internal Planning Manager	Product Technician: Pulp
Engineering	Engineering Manager	Senior Services Engineer	Senior Planning Technician

The workshop started with a general introduction in which the strategic importance of both ISO 9002 and ISO 14001 were highlighted. The problem of achieving simultaneous management of two such seemingly conflicting objectives as that of quality and the environment, and the incorporation of both into strategic management plans was presented. The need for a framework that could address several anticipated problems was introduced and the particular framework was briefly described.

5.3.2 SOFT SYSTEMS ASPECTS OF THE FRAMEWORK

Identifying the potential stakeholders in the problem under concern was addressed next. External stakeholders, including the community, environmentalists and government, were identified along with the internal stakeholders represented at the workshop. The views of such external stakeholders were not included in this workshop, although the possibility of later workshops involving external parties was discussed. The participants were not seen as representing an adverserial group and SAST was therefore not used as a full methodology.

The brainstorming and group discussion aspects of SAST were then employed to identify the main issues associated with compliance to both ISO 9002 and ISO 14001 from the company's point of view. Issues were prioritised in descending order, according to their degree of severity in relation to the successful implementation of ISO 14001 at the mill. A 10-point rating scale was used according to which an issue considered as problematic would score a low value (1) whereas an issue deemed to be non-problematic would be rated high (10). The results are given in **Table 5.2**.

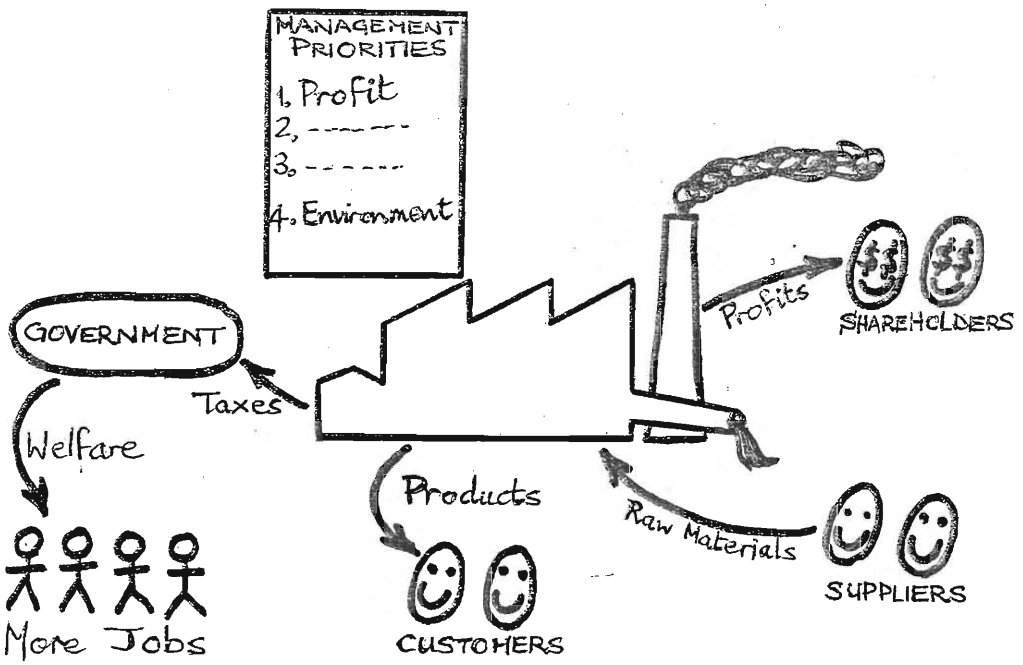
After a brief introduction to the Rich Pictures technique and Root Definitions as elements of SSM, participants were given the task of developing Rich Picture diagrams and Root Definitions for the problem situation. It was suggested that participants should explore that from the viewpoints of both the economic well being and the social view point of the company. The Rich Pictures technique was seen as a tool which expresses the features of the situation. It was decided that a necessary third Rich Picture, from the point of view of the environmentalist lobby, should be left until a future meeting when a broader range of stakeholders would be present. The Rich Pictures are presented in **Figures 5.1 and 5.2**.

TABLE 5.2 : RATING OF ISSUES ASSOCIATED WITH COMPLIANCE TO ISO 9002/14001

ISSUE ITEMS	RATING (Scale 1 - 10)
Top Management Commitment	8.28
Market Competitiveness	6.56
Accountability	6.05
Legal Environment	5.58
Emergency Preparedness	5.53
Costing of Non Conformances	5.25
Training	5.05
Documentation	4.89
Suppliers Compliance	4.89
The Implementation Process	4.61
Community Expectations	4.53
Mental Attitude of Employees	4.53
Environmental Quality	4.39
Communication	4.37
Bureaucracy	4.37
Costing of Implementation	4.32
Teamwork	4.00
Involve All People Available	3.50

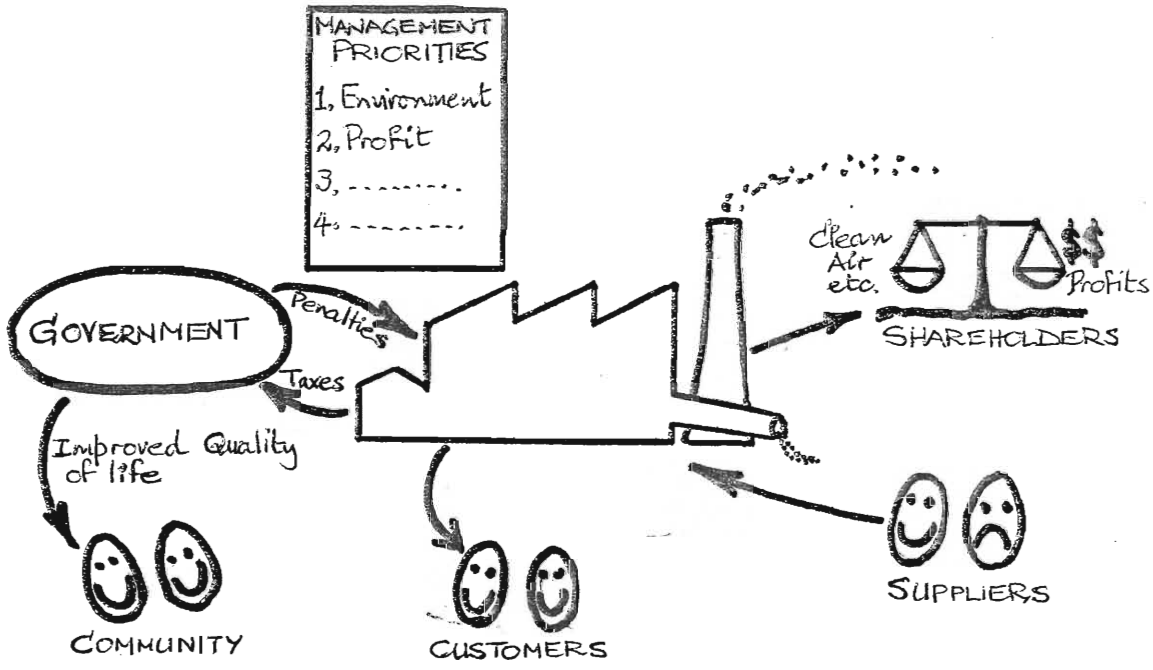
Descriptions of the two viewpoints (viz the *economic* and *social*) were next produced using the CATWOE mnemonic [Checkland & Scholes, 1990], which ensured that all six the relevant elements of each Weltanschauung were formulated. The two CATWOE sets are presented in **Figures 5.1 and 5.2** along with the appropriate Rich Picture.

A mixed success rate with the above SSM techniques was achieved. The participants did not experience great difficulty in expressing issues through pictures (see example of the group's own Rich Picture in **Figure 5.3**). On the other hand, the interpretation of the CATWOE elements caused more difficulty, probably because it was only possible to assemble the 20 managers for a short session, which did not allow for sufficient time for explanations of SSM.



C	Customers	Company Customers and Local Community
A	Actors	The Company Management and Staff
T	Transformation Process	Implement Quality Control that maintains high Ecolomical output and Profitibility
W	Weltanschauung	Provide jobs, good returns for shareholders and uninterrupted Production no matter what the Environmental Consequences
O	Owners	Company Management
E	Environmental Constraints	Existing Natural Resources as Sources of Raw Materials

FIGURE 5.1 : RICH PICTURE AND CATWOE FROM THE ECONOMICAL VIEWPOINT



C	Customers	Present and Future Generations living in the proximity of the Mill
A	Actors	The Company in cooperation with the Government and Community
T	Transformation Process	Implement Quality Control that maintains both high Ecolomical output and preserves the Environment
W	Weltanschauung	The Company has a social responsibility towards its Customers, Employees and Future Generations
O	Owners	Every Member of Company Staff
E	Environmental Constraints	Government Legislation and Market Forces

FIGURE 5.2 : RICH PICTURE AND CATWOE FROM THE SOCIAL VIEWPOINT

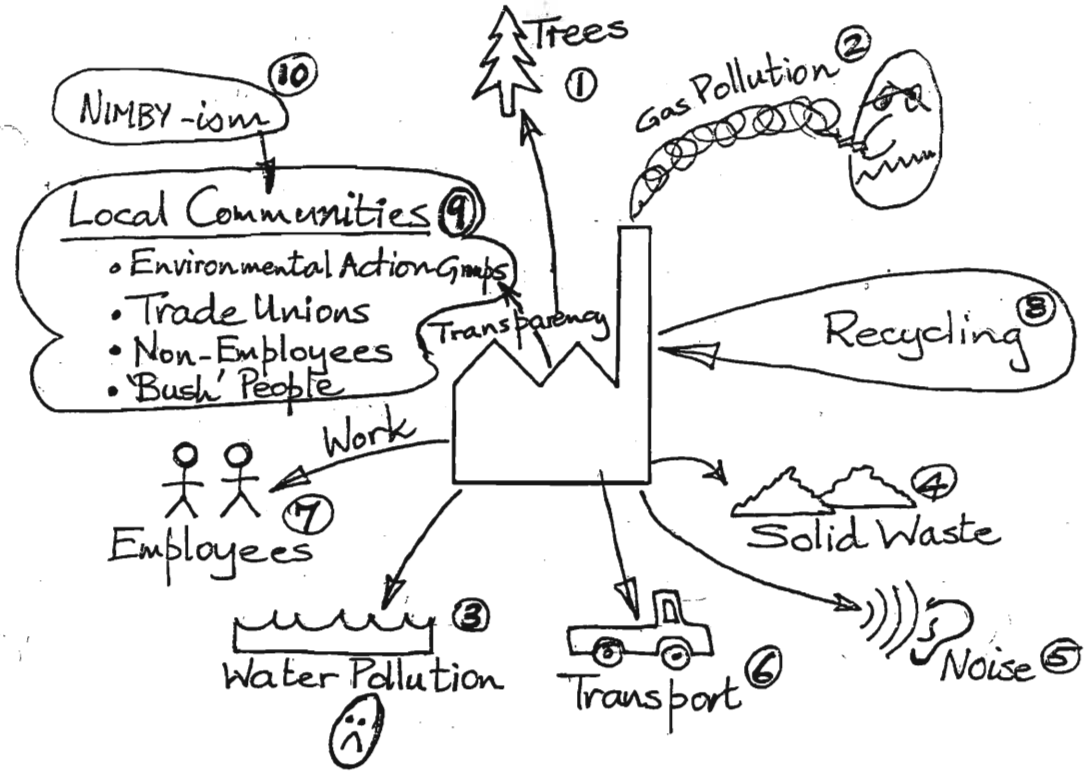


FIGURE 5.3 : RICH PICTURE - THE PARTICIPATING GROUP'S EFFORT

The building and analysis of a 'Rich Picture' and CATWOE definitions as part of the transitional process, from extending ISO 9002 towards implementation of ISO 14001 while continuing on the implementation of ISO 9002 raised the awareness of participants at the workshop to the following points:

- it is essential to define the type of pollutants;
- it is necessary to implement the framework in partnership with the local community;
- it is necessary to involve every member of staff as a vital factor for achieving quality in terms of both ISO 9002 and ISO 14001;
- it is necessary to train staff, shareholders and the local community in the implications of the process of transition to ISO 14001.

5.3.3 MCDM MODELS TO SUPPORT ISO 9002 TO ISO 14001 TRANSITION

Discussions of various aspects of the problem, including the prioritisation of issues, the generation of the Rich Pictures and of the CATWOE analysis, suggested that various working committee members hold conflicting views which may be distorted through a consensus-seeking procedure of decision making. Therefore, a way of allowing for these different views on policy to be expressed should be explored. For this reason a Group Decision Support Environment, Team Expert Choice by Expert Choice Inc. was chosen and a series of AHP models was introduced for the purposes of prioritising issues associated with managing the transition from ISO 9002 towards ISO 14001 compliance.

The importance of developing sets of interrelated AHP models to assist in particular company activities, can be viewed from the standpoint that ordinary company procedures must be understood in terms of how the company makes decisions on important quality and environmental management issues related to ISO 9002 and ISO 14001 standards. The list of AHP models suggested to the mill management is presented in **Table 5.3**.

TABLE 5.3 : SET OF AHP MODELS TO ASSIST IN COMPANY DECISION MAKING

A Model for:-
Allocation of Resources to Quality Management.
Assessment of the Effect of Quality Improvement Activities.
Prioritising Training Needs.
Selection of Raw Material Suppliers.
Selection of Equipment.
Prioritisation of Maintenance Activities.
Rating of Employee Performance.
Evaluation of Customer/Market Preferences.
Evaluation of Alternative Products/Designs.
Evaluation of Employee Suggestions for Continuous Improvement.
Evaluation of Possible Improvement of Products/Services/Processes.
Evaluation of Ecological Risks/Projects.
Resource Allocation of Environmental Protection.
Evaluation of Ecological Disaster Preparedness.

The first workshop ended with an AHP evaluation by the participants of the criteria used for selecting suppliers from the point of view of their ISO 14001 compliance. The hierarchy used is presented in **Figure 5.4a** and the results of the AHP ratings appear in **Figure 5.4b.**

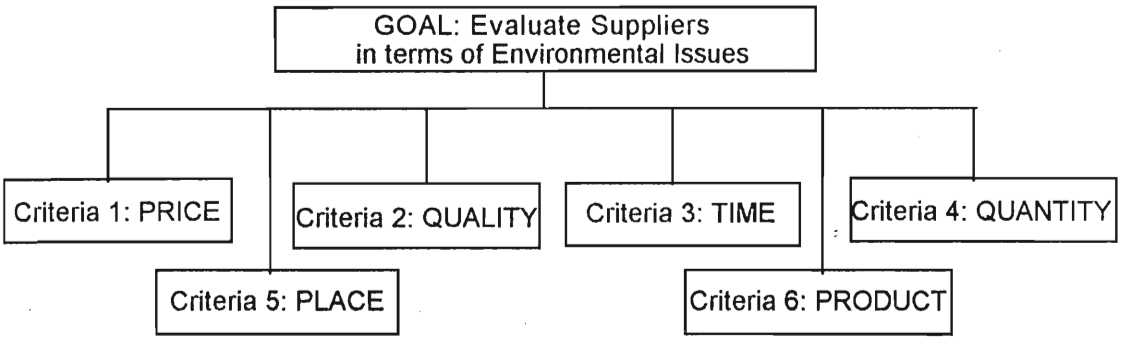


FIGURE 5.4A : AHP HIERARCHY FOR EVALUATING SUPPLIERS

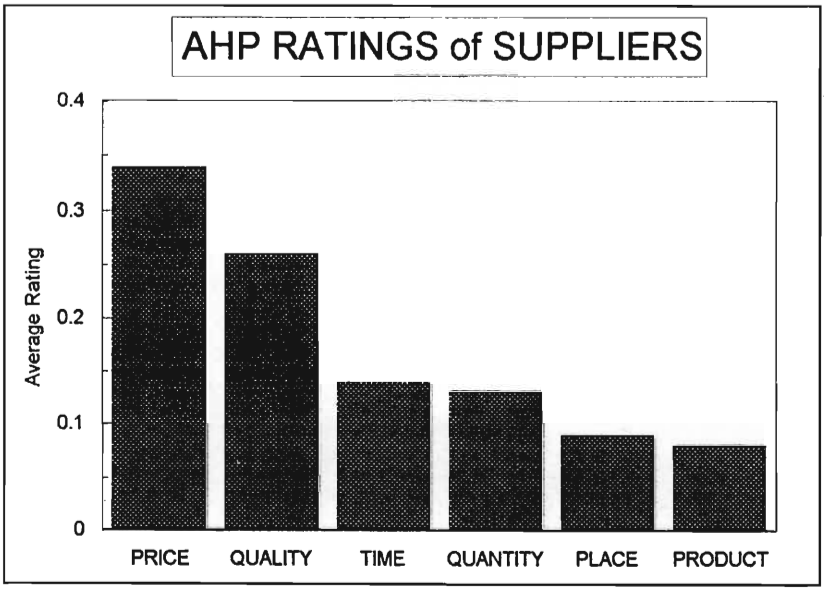


FIGURE 5.4B : AHP RATINGS FOR SUPPLIER EVALUATION

5.3.4 POST-WORKSHOP EVALUATION

The workshops of November 1997 were evaluated by interviewing eleven (11) of the participants. Five questions were put to each participant in separate interviews, which appear with a summary of their responses in **Table 5.4**.

TABLE 5.4 : FIRST WORKSHOP EVALUATION INTERVIEWS

EVALUATION QUESTION	RESPONSES		
The objective of the workshop was to present and demonstrate a framework for TQM implementation. To what extent was this objective realised?	Fully: 27%	Partially: 55%	Not at All: 18%
The Framework consists of 2 Phases: (i) Problem structuring with SAST/SSM (ii) Prioritisation of issues with AHP How useful do you think such a framework would be?	Useful: 73%	Maybe Useful: 18%	Not Useful: 9%
How can the framework be improved?	Participants felt that lack of real understanding percluded comments regarding improvements.		
Should Mondi proceed with this framework?	Yes: 73%	No: 27%	
How should Mondi proceed with this framework?	Arrange follow-up workshops to improve understanding		

5.3.5 DISCUSSION OF THE SAST TECHNIQUE OUTCOMES

The identification of stakeholders were done prior to the workshop by the researcher. He selected managers based on two criteria; first the level of seniority and second the area of responsibility. This was indicated in **Table 5.1** above. The selection was done this way to ensure a wide range of opinions both reflecting the possible differences between levels of seniority and between managers from different areas (eg engineering vs production).

These differences were, however deemed not to represent conflictual opinions and the discussion should not be seen as a dialectic one. This assumption was confirmed by the discussions and subsequent ratings of issues. The results achieved support the view that little separates the management's acceptance of the need for a common rationale for implementing ISO 9002 and ISO 14001, to pursue market competitiveness in what they perceive to be an increasingly difficult global industry.

Expanding this technique to include a wider group of stakeholders is suggested for further research. Including representatives from the community, government and customers should theoretically represent a conflictual grouping and the issue of SAST as a vehicle to encourage debate should be considered.

The ratings of the issues raised by the brainstorming element of SAST were presented in **Table 5.2** above.

This Table indicates how participants ranked environmental issues in order of their greater urgency and likelihood. Findings indicated that management commitment towards implementing ISO 14001 was rated as the least problematic of the 18 issues identified during the brainstorming session. This is followed in the Table by an understanding of the need to achieve compliance with ISO 14001 standards to maintain market competitiveness. In contrast, 'soft' system human resource aspects of implementing ISO 14001 were ranked as the most problematic, and these factors are to be found at, or near, the foot of the Table.

It will also be noted that the need to meet community expectations, change the behavioural attitudes of employees, reduce bureaucracy, and maintain an acceptable level of environmental quality, also featured in the lower half of the Table. This indicates that these factors were regarded as more serious issues requiring constant

attention from Mondi management if ISO 14001 standards are to be successfully implemented at the Richards Bay paper mill. However, the majority of participants also identified the cost of implementing the ISO 14001 programme as a highly problematic issue. In recognising this factor as a major concern, participants were clearly facing up to business realities, since implementation of the programme is a complex technical task which will involve high capital expenditure for the company. The cost aspects were further developed during the second workshop.

Finally, two 'soft' system issues, including the promotion of team work and the involvement of all staff in achieving the successful transition from ISO 9002 to ISO 14001, were also regarded as highly problematic. Here again, the general sense of realism displayed by participants was welcome, since nobody appears to underestimate the considerable task which lies ahead in empowering historically disadvantaged operatives, mainly by providing suitable ISO 14001-related education and training programmes as a form of personal development in the future.

It is also noteworthy that this conclusion was reached during the brainstorming session and was largely based on grounds of economic necessity. In other words, participants recognised that ISO 14001 will have to be implemented as the most effective means of achieving/maintaining market competitiveness in the future. At the same time, participants were also aware that one of the main handicaps towards achieving this goal is the need for greater teamwork through involvement of all employees at the Richards Bay paper mill.

Evaluating these ratings in terms of the anticipated problems, presents:

(i) Driving Focus For ISO 14001 Implementation

The same emphasis is found in the evaluation of the views of the group of managers, used to identify the anticipated problems, and the rating from this larger group. This view argues that the ISO 14001 process should be driven by both external requirements like the community expectations and by internal benefits like cost/benefit improvements. This is clear from the ratings, with community expectations (4.53) and costing issues (4.32) rating very similar in terms of urgency and importance.

(ii) Participation/Ownership

This is clearly an important issue, with several related sub-issues rating low (ie in need of emphasis). These are; Involving all employees (3.50); Teamwork (4.00) and Internal Communication (4.37). Another aspect relates to the commitment to the TQM process. While the commitment of management rates less problematic (8.28), the commitment and attitude of employees (4.37) is seen as in need of attention. This difference could be explained solely from the point of view that managers are expected to rate their own commitment as adequate, but it does indicate management's view that management commitment alone is not adequate for the transition process but that commitment to the change process should be achieved as widely as possible.

(iii) Conflicting Objectives

The 'messy' nature of the simultaneous application of ISO 9002 and ISO 14001 issues were also evident from the Issues List and Ratings, when both *cost* and *environmental* issues were rated as problematic. Economical objectives, including profits, growth and dividends, and ecological objectives are often seen as mutually exclusive. The similarity in rating of costing issues (4.32) and that of environmental quality (4.39) indicates the realisation on the part of management that the road to ISO 14001 must balance these seemingly conflicting objectives. A particular aspect is the difference between the ratings of compliance to the legal Environmental requirements (5.56), compliance to the community expectations (4.53) and ensuring Environmental quality (4.39). Management, therefore sees the legal objectives, as set by government, easier to attain than it would be to satisfy the expectations of other stakeholders like the community.

5.3.6 DISCUSSION OF THE SSM TECHNIQUES OUTCOMES

Figures 5.1, 5.2 and 5.3 provide examples of how participants developed 'Rich Picture' diagrams to explore ISO 14001 issues from the standpoints of both the economic well-being of the company, and the social perspective of the company's role in the Richards Bay community. The 'Rich Picture' exercise was used by managers as an effective tool for identifying key features of what emerged as an increasingly complex 'messy problem' situation. **Figure 5.3** particularly was an attempt by the participating group themselves.

Figure 5.2 shows the concern expressed by the participants in the workshop about the need to balance the interests of the shareholders with the requirements of the law protecting the environment. The major outcome was seen as an improved quality of life. The difference between the rich picture under this Weltanschauung and the one influenced only by the economic well being of the company **(Figure 5.1)** is in the priorities of the values of the company management and in the attitude of the surrounding community towards the role of the company.

The dramatic difference between these two viewpoints was recognised by the Mill Manager when he argued that the listing of Environment as number 4 on the priority list of management **(Figure 5.1)** was wrong, as he felt that it deserved a higher priority rating. He was shown that from the economical Weltanschauung **(Figure 5.2)** environment rated number 1. This illustrates the strength of SSM to highlight the fact that the same issue is evaluated differently depending on the Weltanschauung adopted. This aspect was also clearly seen in the wide ranging descriptions created using the CATWOE analysis.

The success rate with the above techniques of SSM was mixed. The audience did not have much trouble in expressing issues through pictures. On the other hand the interpretation of the CATWOE elements caused difficulty due probably to the short sessions, which did not allow for sufficient time for explanations of SSM.

The building and analysis of a 'rich picture' and CATWOE definitions for the process of transition to ISO 14000 while continuing on the implementation of ISO 9002 raised the awareness of the management and of every participant in the workshop to a number of important points and in this analysis several of the anticipated problems for ISO 14001 implementation were addressed.

(i) Participation In And Ownership Of The System

Not only did the exercise illustrate the participatory nature of SSM itself, by the group actively participating in the rich pictures and CATWOE analysis, but it also raised awareness of the need to involve a wide range of stakeholders.

(ii) Existing Culture/Systems Undervalued

The problem of forcing new systems onto people holding diverse viewpoints were graphically illustrated. The diverging rich pictures and CATWOE analysis showed the managers that the views currently held by different stakeholder groups need to be explored and that the transition to ISO 14001 should take full cognisance of these viewpoints. Although the time limits made it impossible to fully explore SSM's strength in highlighting different views, this introduction did show a way forward. Several of the participating managers expressed the view that SSM should be used more regularly at Mondi in the future. Particularly, the strength of SAST and SSM was recognised by the Senior Human Resource Officer in terms of industrial relations disputes.

(iii) Multiple (Conflicting) Objectives

The 'messy' nature of managing quality and environmental issues simultaneously was demonstrated by the SSM techniques. The complexity created by the wide range of viewpoints as to what should be regarded as priorities, were clearly illustrated. In the follow-up interviews several managers acknowledged that the appreciation of different views is normally lacking and expressed high regard for SSM as a vehicle to alleviate this problem.

5.3.7 DISCUSSION OF THE AHP TECHNIQUE OUTCOMES

The discussions of various aspects of the problem related to the prioritisation of issues, the generation of the Rich Pictures and of the CATWOE analysis suggested that usually various members of working committees hold conflicting views which can be distorted through a procedure of decision making by consensus. This observation was substantiated in the follow-up interviews when several of the more junior managers expressed concern that they felt their opinions were lost to that of senior members of the team. The problem of lack of confidence to express a view (particularly if the views could be seen as radical) in the presence of their direct superiors was also mentioned.

For this reason it was suggested that the final choice phase of decision making should be facilitated by using a group decision making technique, AHP, that does not rely on consensus but rather allows prioritising of issues based on pairwise comparisons. Several AHP models were suggested to Mondi management to assist in particular aspects of ISO 9002 and ISO 14001 implementation. Due to time constraints at the workshop one fairly simple hierarchy was used to illustrate the use of AHP.

Participants were asked to rank the six main factors, using paired comparisons, which have to be reconciled when companies have to choose between different suppliers of similar goods or services. **Figure 5.4b** shows that participants ranked the Price of Raw Materials as most important in the evaluation of suppliers, using criteria shown in **Figure 5.4a** as a means of ensuring the effective transformation from ISO 9002 towards ISO 14001. The difference in weighting between Price and Quality, of 18 per cent, is close enough to support the conclusion that participants exercised balanced judgement in their comparative assessment of both factors, especially as Quality was ranked as twice more important than the other four criteria in the evaluation.

These findings are encouraging because, despite the well-known management dilemma of how to 'trade-off' the demands of high productivity without sacrificing quality, participants were able to reconcile these rival claims reasonably closely, which suggests that the implementation of ISO 9002 procedure has raised management awareness of quality issues at the Richards Bay paper mill. With the transformation from ISO 9002 to ISO 14001 in mind, it would not be unreasonable to suppose that the same 'organisational learning' should occur once the latter procedures have been implemented. However, AHP simulations are no substitute for reality, and concrete benefits will only accrue once suitable training has been provided and the ISO 9002 and ISO 14001 variables listed in **Table 5.3** have been assimilated into standard working practices at the paper mill.

This introductory use of AHP could not show adequately the utility of using a multi-methodology approach as represented by linking SSM and AHP. The results were, however, encouraging and should be given further attention. A question that still needs to be answered in the subsequent stages of this intervention is whether the MCDM approach fits in the framework as a vehicle of gaining a better interpretation of the forces affecting the whole transition to ISO 14001. If that is the case the approach may fall into the trap of the methodological imperialism of the interpretivist paradigm. This situation is not desirable ([Petkov, et al, 1998]; [Jackson, 1991]).

The potential of the framework applied here lies in the combination of the interpretivist features of SSM with the social awareness concern of Critical Systems Thinking and the persuading power of an MCDM approach that is traditionally seen as a functionalist tool. It is believed that such a combination can contribute to the meaningful change of attitudes in the social system, associated with the transition to compliance with ISO 14001 at the paper mill.

5.3.8 SUMMARY OF THE FIRST WORKSHOP OUTCOMES

This workshop facilitated the involvement of the researchers and Mondi Managers in the initial steps of clarifying the complex problem associated with the transition to ISO 14001 by Mondi Kraft Paper and Pulp Mill. It cannot be treated fully by a single methodology or a model revealing only a small portion of the factors associated with it and for this reason a combination of several techniques based on ideas related to the Multimethodology meta approach were suggested and used.

It has been asserted that a suitable vehicle for the promotion of Ecological Modernisation is the enforcement of international standards governing quality and environmental issues like ISO 9002 and ISO 14001. At a local level these standards need to be operationalised into a set of working proposals and measures to ensure compliance with them. The initial results indicate that the suggested framework combining elements of SAST, SSM and AHP provides the diversity of perspectives needed, promotes participation in the process and gives a sense for direction in the multifaceted management intervention on this problem.

At Mondi Kraft, however, other organisational development programmes are pursued simultaneously. These separate interventions need to be integrated to achieve the maximum overall success. One major organisational change programme is administered through the Human Resources Department and uses information from a survey developed by Hall [1992] to identify the change priorities. Further, member of HR/ Training issues associated with compliance to both ISO 9002 and ISO 14001 were identified during Workshop 1. These two reasons, the need for integration and the overlap of HR issues, presented the opportunity to investigate the relationship between the OCI survey scores and the ISO 9002/14001 framework.

5.4 ORGANISATION CULTURE SURVEY - MAY 1997

5.4.1 INTRODUCTION

In May 1997, Mondi Kraft proceeded beyond the previous climate surveys to address the organisational culture components in what was thought to be a meaningful way through an instrument called the Organisational Competence Index (OCI) which operates at team level by using the Team Competence Index (TCI) and at an individual level, forming part of the Team Leader Development Programme (TLDP). The purpose of the OCI survey was to identify gaps between the actual and desired operational conditions for competence, and serve as basic prerequisites for a healthy and productive environment. This survey was administered by the Mondi Kraft Human Resource Department. The survey was originally not contemplated as part of the current research, until the availability of this survey data was seen as an opportunity to investigate whether findings in departments which had either implement ISO 9002, or had yet to do so, were different for workshop participants.

5.4.2 THE OCI MODEL AND SURVEY

The Organisational Competence Model developed by Hall [1992] is an instrument consisting of ten basic conditions for competence, as a generic concept, which includes collaboration, commitment and creativity. The underlying principle implies that it is management's basic responsibility to create the conditions for their team members to exercise their competence, which will result in a positive morale and high levels of performance. This is not an original contribution to management thought and Hall [1988] acknowledges this by arguing that organisational competence is an attempt to provide a model synthesising what he calls 'well-known behaviour models' [Hall, 1988 : 446]. The models he refers to include that of McGregor [1960], Blake & Mouton [1962], Maslow [1943] and Herzberg [1966]. These three main conditions need to flow in sequence and receive equal attention by the manager in order to be effective.

Hall [1992] defines the Competence Process as 'a system for maximising quality performance by releasing the human potential available' in an organisation. This depends on the potential Collaboration behaviour of employees and its impact on their Commitment and Creativity, which can lead to increased Competence and Performance.

These three contributory elements of Competence are divided into nine sub-factors. Organisational Competence is postulated as a 'survey of what life is like in organisations' and measured using an inventory comprising 40 questions which cannot be reproduced here for copyright reasons. Each question is answered by one of three statements, labelled A, B, or C, however respondents are required to answer each question twice, viz as they 'think it (the organisation) is', and as they 'would like it to be'. Each statement may also be scored in four different ways, ranging form 'strong' to 'weak' support, (eg AA, A, Ab, Ac, BB, B, Ba, Bc, and CC, C, Ca, Cb), resulting in 24 possible answers to each question.

5.4.3 OCI SURVEY SCORES

Departments were divided into three cohorts; namely, ISO, which included departments directly involved in the manufacture and testing of paper pulp to ISO 9002 standards, and SEMI- and NON-ISO servicing departments, which included engineering, marketing, accounting and human resources management, depending on the extent to which ISO 9002 procedures had been adopted (cf 5.2.2 above). The OCI scores for thirteen teams were obtained from the OD Section. Data for each team included; the team title, normally in the form of the team leader's title (eg Mechanical Engineer and team); the number of team members; the average team scores, for each of the 10 factors rated, both actual and desired. The data relating to team composition is presented in **Table 5.5** with the teams divided into the 3 ISO cohorts. The OCI scores of the teams, included in each cohort were averaged, using a weighted average by team size. Results appear in **Figure 5.5a** and statistical analysis appear in **Figure 5.5b**.

5.4.4 DISCUSSION OF OCI SURVEY FINDINGS

In an interesting development published since the first workshop, the researcher found statistically significant differences in average Organisational Competence scores [Hall, 1992] for employees in departments where ISO 9002 had either been fully, partly, or not yet implemented. For convenience, these departments are referred to as ISO, SEMI-ISO and NON-ISO, respectively. Since the lowest average scores were recorded in the ISO departments, an understandable concern was raised that these findings might jeopardise the transformation from ISO 9002 to ISO 14001.

The weighted average scores, on each of the ten OCI factors were plotted in **Figure 5.5a**. Using the t-test for paired data the results are shown in **Figure 5.5b**. The differences between the Non-ISO, Semi-ISO and ISO groups are statistically significant as indicated, with the lowest overall scores registered by the ISO cohort. The significance of the differences between the Semi- and Non-ISO cohorts is lower than 95% confidence, this fact, coupled with the smaller number representing these two cohorts led to a two-way split in the discussion to follow. The Semi-ISO and Non-ISO groups will, therefore, be combined and the discussions will compare the ISO cohort with this combined Semi/Non-ISO cohort.

TABLE 5.5 : OCI SURVEY TEAMS AND SCORES

TEAM	Responses	OCI FACTOR									
		1	2	3	4	5	6	7	8	9	10
Non-ISO 1	6	18	38	46	32	61	51	39	53	28	41
Non-ISO 2	9	78	46	93	90	88	81	87	72	89	71
Non-ISO 3	4	67	52	59	58	67	70	62	83	70	58
Non-ISO 4	6	30	30	24	10	9	23	28	27	19	26
Non-ISO Average	25	50.3	41.2	59.7	51.8	59.2	58.1	57.3	58.4	54.5	50.9
Semi-ISO 1	18	53	26	69	32	45	46	39	48	65	62
Semi-ISO 2	5	67	98	52	29	90	15	87	17	78	51
Semi-ISO 3	6	67	35	46	53	61	65	65	68	61	47
Semi-ISO 4	5	57	30	30	58	51	54	52	38	26	33
Semi-ISO Average	34	58.1	38.8	56.7	39.1	55.3	46.0	52.6	45.5	60.5	53.5
Full-ISO 1	7	57	23	41	36	36	37	10	77	43	18
Full-ISO 2	12	48	41	46	36	33	30	39	53	26	33
Full-ISO 3	16	30	30	30	24	29	20	25	38	23	22
Full-ISO 4	11	48	20	34	47	33	33	28	53	19	30
Full-ISO 5	26	42	23	34	26	33	33	38	40	28	34
Full-ISO Average	72	42.5	27.1	35.8	31.3	32.5	29.8	31.0	47.1	26.7	28.9

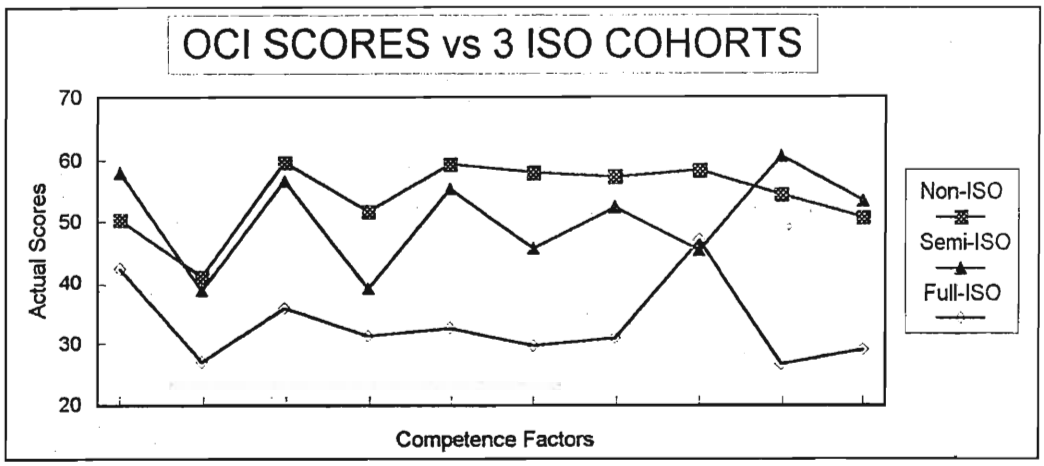


FIGURE 5.5A : OCI SCORES VS ISO IMPLEMENTATION

COHORTS	Non-ISO vs Semi-ISO	Semi-ISO vs ISO	Non-ISO vs ISO
Mean of Differences	3.551	17.312	20.863
Std Dev of Differences	7.099	9.333	6.982
t-Value	1.582	5.866	9.449
Statistical Significance	Not Significant (p=0.075)	Significant (p=0.0005)	Significant (p=0.0005)

FIGURE 5.5B : STATISTICAL DATA OF THE OCI SCORES VS ISO IMPLEMENTATION

In keeping with Multimethodology principles, any valid research which provides fresh insights into ways of assisting the implementation of ISO 9002/14001 procedures should be welcomed. For example, a key factor in the OCI survey findings is that the Semi/Non-ISO participants include a majority of professionally-qualified managers with backgrounds in accounting, engineering, marketing and personnel management. Although it cannot be claimed without further testing that differences in their professional experience would help explain the higher average Commitment scores recorded, it is conceivable that these managers are required to display more Creativity (ie An important component of Organisational Commitment in the OCI instrument) than ISO-participants who are employed in production-related tasks where emphasis is necessarily placed on routine manufacture and testing, consistency and control. This would be broadly in line with the contingency findings of Burns & Stalker [Burns, 1963].

That said, two caveats remain about the Hall OCI instrument. First, the theoretical links between the potential for Collaboration, Commitment and Creativity, identified as precursors to Competence and Performance, are not fully explicated in the model. For example, Commitment is only discussed in a 'broad brush' way without reference to the detailed empirical analyses of Martin & Nichols [1987] or O'Reilly [1991]. The latter studies reach far more cautions conclusions about how Commitment may be identified, and its relevance to work-place situations.

Second, the Hall [1992] instrument provides a maximum total of 960 responses to 40 questions for respondents. There is no discussion about the high probability of 'inventory fatigue', or misunderstanding of statements by respondents in a South African context, where only a minority of bi- and tri-lingual citizens speak English as their preferred first language. In the case of Mondi Kraft survey, prior 'face validity' testing should have been conducted to avoid both forms of misapplication of the Hall OCI Survey Instrument. To eliminate these risks, replication of the OCI Survey is recommended to clarify its impact on the ISO 9002/14001 transformation programme [McEwan, et al, 1998].

5.5 THE SECOND WORKSHOP - APRIL 1998

5.5.1 INTRODUCTION

A follow-up workshop was held in April 1998, and addressed outstanding issues from the first workshop and also addressed issues raised by the analysis of the relationship between OCI survey scores and ISO 9002 implementation levels referred to in 5.4 above.

5.5.2 THEORETICAL ISSUES ADDRESSED AT WORKSHOP 2

Slack, et al [1997] identify seven cost factors at the operational and strategic levels in organisations which need to be evaluated before ISO 9002 procedures can be successfully transformed into an effective TQM policy. To achieve this standard at an Operational level, Prevention, Appraisal and Internal Failure costs must be assessed, whereas at the Strategic level, the costs of External Failure, Unclear Management Strategy, the degree of Top Management Support and Socio-Political issues must also be known [McEwan, et al, 1998].

The achievement of acceptable environmental standards depends on similar Cost/Benefit considerations, according to Welford & Prescott [1994], who identify six cost areas, three in evaluating an environmental strategy at the company level; namely, the cost of Operational and External Failures, and Future Threats to the organisation; and a further three costs in achieving Sustainable Development as a Company Response; namely, the costs of Environmental Management at the local plant level, Strategic level; and their Auditing as a source of Competitive Advantage [McEwan, et al, 1998].

5.5.3 ACTIVITIES DURING WORKSHOP 2

Two cohorts of ten self-nominating managers, including five from ISO and five from SEMI/NON-ISO departments, completed an original survey instrument [McEwan, 1998a], consisting of 75 statements, which was divided into two parts, and included the 13 Quality Assurance and Environmental Management cost factors discussed above. Participants evaluated each statement using a seven-point Likert-scale consisting of 'Low/High Importance' and 'Agree/Disagree' responses. The participating managers are listed in **Table 5.6** indicating the cohort to which each belonged. Two sessions were run,

one with each cohort, and the first involved the Semi/Non-ISO group while the second involved the ISO cohort.

TABLE 5.6 : SECOND WORKSHOP TEAMS

Area	Semi/Non-ISO Team	Area	ISO Team
Marketing	Commercial Services Manager	Production	Mill Manager
Finance	Financial Accountant	Production	Chem. Plant Manager
HR/Training	Production Training Manager	Technical / Laboratories	Technical Manager
HR/Training	Manpower Training Manager	Technical / Laboratories	Environmental Technologist
		Engineering	Senior Planning Technician

Each session started with a brief introduction on the theoretical cost issues of both ISO 9002 and ISO 14001. A review was given emphasising that the process of organisational learning, started at the first workshop, would be advanced and broadened by adding a cost/benefit approach, which was the aim of the second workshop. The participating managers were then asked to complete the survey instrument on the 7 main ISO 9002 cost factors, which were subsequently rated pairwise using AHP analysis. The same sequence was followed for the second survey instrument when 6 main cost factors relating to ISO 14001, were evaluated. The data emanating from this workshop was complemented by additional data during a post-workshop data collection exercise and the complete data-sets are presented below. The discussion of the findings is also done later, based on the responses from this augmented participating group.

5.6 THE THIRD WORKSHOP - SEPTEMBER 1998

5.6.1 INTRODUCTION

A third workshop was conducted in September 1998. This workshop addressed several strategic and policy issues regarding the introduction of ISO 14001.

5.6.2 THEORETICAL ISSUES ADDRESSED AT WORKSHOP 3

Welford [1998] identifies several aspects that require attention at strategic management level to ensure a sound environmental policy approach. There has been much debate about appropriate tools for the improvement of the environmental performance of companies. This has resulted in the introduction of environmental management systems and their associated standards, environmental auditing and reporting and tools focusing on the environmental performance of products such as life cycle assessment. These tools have been most often applied to manufacturing industries and to tangible products. However, there is now a need to go further than simply addressing the environmental performance of companies if the aim is to be sustainable development. Welford, et al, [1998] therefore seek to address issues of corporate responsibility in the context of sustainable development. They question the appropriateness and efficacy of contemporary corporate environmental management tools alone and investigate ways in which all businesses can better respond to the demands of the sustainable development agenda. They compare and discuss several frameworks, finally advocating a model which is a combination of many different people's work and brings together many of the issues discussed in previous frameworks. It has the advantage of placing rather more emphasis on social and ethical issues than many of the earlier approaches did. This is consistent with the increasing acceptance of the need to address the social dimensions of sustainable development as much as the environmental ones. It is based on six Es consisting of the Environment, Empowerment, Economics, Ethics, Equity and Education. We can view these as six areas where the business should have a clear policy and agenda for change. **Table 5.7** outlines these policy areas along with suggested tools for operationalising a change process.

5.6.3 ACTIVITIES DURING WORKSHOP 3

The workshop started with a brief introduction to the theoretical framework discussed above. It was indicated that the policy areas identified in this model could be ideal to evaluate within the Mondi Kraft context. Five managers **(Table 5.8)** from the ten participants of the previous workshop, completed an original survey instrument [McEwan, 1998b] based on the framework suggested by Welford, et al [1998]. This instrument consisted of 41 statements on the six factors identified above. Participants evaluated each statement using a seven-point Likert-scale consisting of 'Agree/Disagree'

responses, and subsequently rated the six policy areas, pairwise, using AHP analysis.

TABLE 5.7 : POLICY AREAS AND TOOLS FOR SUSTAINABLE DEVELOPMENT [Welford, et al, 1998]

POLICY AREA	INDICATIVE TOOLS
Environment	Life Cycle Assessment
	Environmental Management System And Audits
	Functionality Assessment
	Resource Management
Empowerment	Teambuilding
	Participation
	Equal Opportunities
	Declaration Of Rights
Economics	Profits/Surplus
	Employment
	Quality
	Long-Term Financial Stability And Investment
Ethics	Transparency Of Objectives
	Openness To Concerns
	Honesty
	Values Statement
Equity	Fair Trade Policy And Activity
	End-Price Auditing
	Development Aid
	Sponsorship
Education	Training
	Customer Information
	Community Involvement
	Campaigning

TABLE 5.8 : THIRD WORKSHOP TEAM

Area	Manager Title	ISO Cohort
Production	Mill Manager	ISO
Production	Chemical Plant Manager	ISO
Finance	Financial Accountant	Non-ISO
Technical / Laboratories	Environmental Technologist	ISO
Engineering	Senior Planning Technician	ISO

5.7 POST WORKSHOP DATA COLLECTION

The smaller numbers of managers attending the second and third workshops were caused by operational requirements which limited the availability of certain managers. The lower number of responses was, however, seen as problematic and could possibly limit the validity of any subsequent analysis performed on the data. To eliminate this problem, the researcher distributed the various survey instruments and AHP rating forms to all the original 20 managers who attended the first workshop, but who missed either one or both of the later two workshops. The statistical results of the 3 survey instruments are presented in **Tables 5.9a, 5.9b and 5.9c**. The AHP pairwise ratings are presented in **Figure 5.6** for the ISO 9002 cost factors; in **Figure 5.7** for the ISO 14001 cost factors and in **Figure 5.8** for the environmental policy factors.

5.8 DISCUSSION OF THE SECOND WORKSHOP FINDINGS

5.8.1 INTRODUCTION

The second workshop sought to advance the work started during the first workshop but also to investigate the OCI scores problem further. The discussion focuses on the data-set which includes results from both the actual workshop and the post-workshop data gathering exercise, discussed above.

TABLE 5.9A : STATISTICAL DATA FOR THE ISO 9002 INSTRUMENT

Cost Factors	Cohorts	Mean	Std Dev	Variance	t-Value	Statistical Significance
Prevention Costs	ISO	6.03	1.12	1.25	0.238	Not Significant
	Semi/Non-ISO	6.08	1.18	1.40		
Appraisal Costs	ISO	5.62	1.25	1.56	0.155	Not Significant
	Semi/Non-ISO	5.58	1.09	1.20		
Internal Failure Costs	ISO	4.83	1.43	2.04	0.581	Not Significant
	Semi/Non-ISO	5.00	1.26	1.59		
External Failure Costs	ISO	5.03	1.39	1.86	0.912	Not Significant
	Semi/Non-ISO	4.77	1.80	3.27		
Unclear Strategic	ISO	5.28	1.44	2.07	1.449	Not Significant
Management Costs	Semi/Non-ISO	4.90	1.46	2.13		
Top Management	ISO	5.37	1.63	2.68	1.547	Not Significant
Support: Costs/Benefits	Semi/Non-ISO	5.77	1.16	1.33		
Socio-Political Costs	ISO	4.48	1.67	2.79	2.480	Significant
	Semi/Non-ISO	3.77	1.49	2.22		

TABLE 5.9B : STATISTICAL DATA FOR THE ISO 14001 INSTRUMENT

Cost Factors	Cohorts	Mean	Std Dev	Variance	t-Value	Statistical Significance
Operational Costs	ISO	6.20	0.71	0.50	nil	Not Significant
	Semi/Non-ISO	6.20	0.91	0.84		
External Failure Costs	ISO	4.67	1.51	2.29	0.418	Not Significant
	Semi/Non-ISO	4.55	1.55	2.39		
Future Threats Costs	ISO	5.30	1.44	2.08	1.023	Not Significant
	Semi/Non-ISO	5.02	1.59	2.53		
Operational Environment	ISO	4.58	1.29	1.67	0.928	Not Significant
Management Costs	Semi/Non-ISO	4.83	1.64	2.68		
Strategic Environmental	ISO	5.02	1.08	1.16	1.508	Not Significant
Management Costs	Semi/Non-ISO	5.36	1.17	1.38		
Environmental Auditing	ISO	4.83	1.30	1.70	1.261	Not Significant
(Costs/Benefits)	Semi/Non-ISO	4.50	1.58	2.49		

TABLE 5.9C : STATISTICAL DATA FOR THE ENVIRONMENTAL POLICY AREAS INSTRUMENT

Cost Factors	Cohorts	Mean	Std Dev	Variance	t-Value	Statistical Significance
Environment	ISO	4.50	1.44	2.07	0.298	Not Significant
	Semi/Non-ISO	4.44	1.41	1.99		
Empowerment	ISO	3.96	1.45	2.11	0.160	Not Significant
	Semi/Non-ISO	3.93	1.51	2.27		
Economy	ISO	4.99	1.14	1.31	1.931	Not Significant
	Semi/Non-ISO	4.57	1.38	1.90		
Ethics	ISO	3.94	1.39	1.94	1.390	Not Significant
	Semi/Non-ISO	3.56	1.34	1.80		
Equity	ISO	4.17	1.28	1.63	0.963	Not Significant
	Semi/Non-ISO	3.95	1.18	1.40		
Education	ISO	5.12	1.04	1.09	0.995	Not Significant
	Semi/Non-ISO	4.88	1.35	1.82		

5.8.2 STATISTICAL FINDINGS RELATED TO THE ISO 9002 AND 14001 COST FACTORS

Tables 5.9a and 5.9b show the t-test comparisons between the ISO and Semi/Non-ISO cohorts for the 7 cost factors related to ISO 9002 and the 6 cost factors related to ISO 14001 respectively. In only one of these 13 cases is the difference in mean responses indicated as significantly different (at 95 % confidence level), namely the socio-political costs related to ISO 9002. This difference could be explained by recognising that this issue is a 'soft' issue, probably the 'softest' of all 7 cost factors tested in this survey. What is, however, more difficult to explain is the *direction* of the difference, ie the higher (4.48) rating by the ISO cohort as compared to the lower (3.77) rating registered by the Semi/Non-ISO group. This higher rating seems to indicate that the ISO group deems factors, such as unionisation, cultural, language and political issues, as more important than the degree to which the Semi/Non-ISO cohort rates these issues. The reverse would be more in line with a view that the Semi/Non-ISO group contains managers in Human Resource Management and Training, who could be expected to be more concerned with socio-political issues. The significant difference is due mainly to 2 respondents, one who rated all the questions under this heading as a 7 (Very Important) and a second, who rated all the questions as a 1 (Very Unimportant).

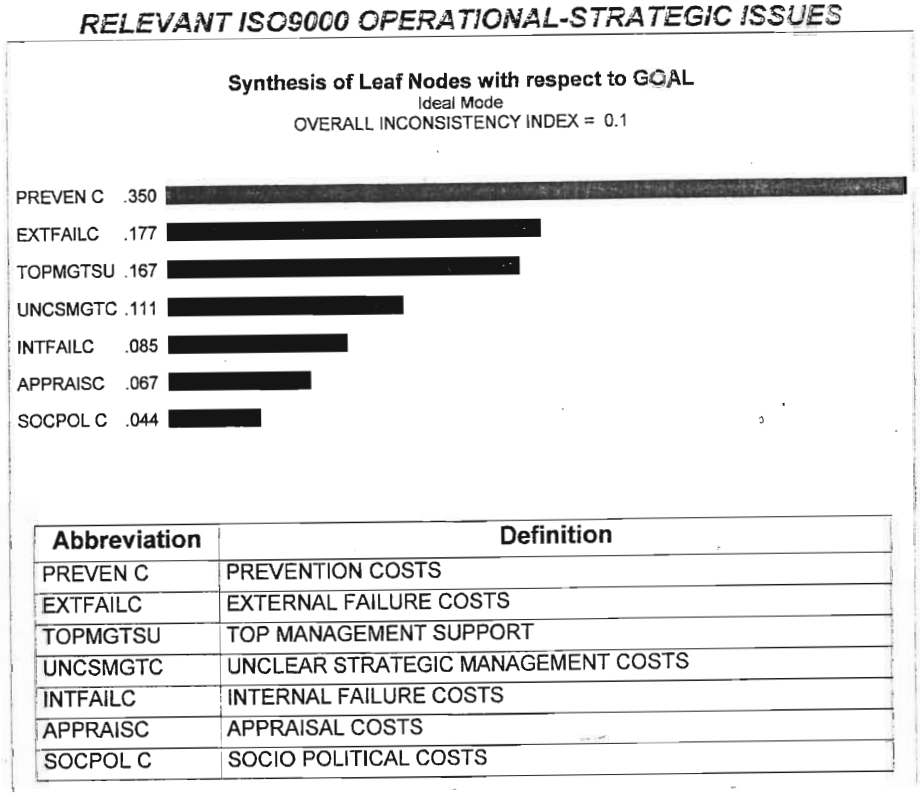
The 'high' responder was in the ISO cohort while the 'low' responder was in the Semi/Non-ISO group. If these 2 responses are excluded, the resulting means (ISO = 4.20 and Semi/Non-ISO = 4.04) are not significantly different.

On a more positive note, it is reassuring that no significant differences were recorded in the evaluations of both cohorts on 12 of the thirteen cost factors involved in implementing ISO 9002 and ISO 14001 procedures. These findings should help alleviate concerns about the possible negative impact on the ISO 9002/14001 transformation programme of reported differences between cohorts in the earlier Hall [1992] Organisational Competence survey.

The OCI instrument is heavily biased towards motivational and human resource management principles. Hall [1988] links the Competence theory with the 9/9 management style [Blake & Mouton, 1962] and places great emphasis on creativity and the freedom to make own decisions. ISO 9002/14001 systems, on the other hand, could best be described as 9/1 style and emphasise regulation and control (bureaucracy). Bureaucracy increase was, further, rated during the first workshop as a problem with a rating of 4.37. These findings need serious consideration in further research, paying particular attention to why conflicting results are evident for ISO and Non-ISO cohorts, viewed from a human resource perspective, while results converge when using a cost/benefit approach. Similar convergence was also found in the evaluation of environmental policy areas during Workshop 3 (see 5.9.2 below).

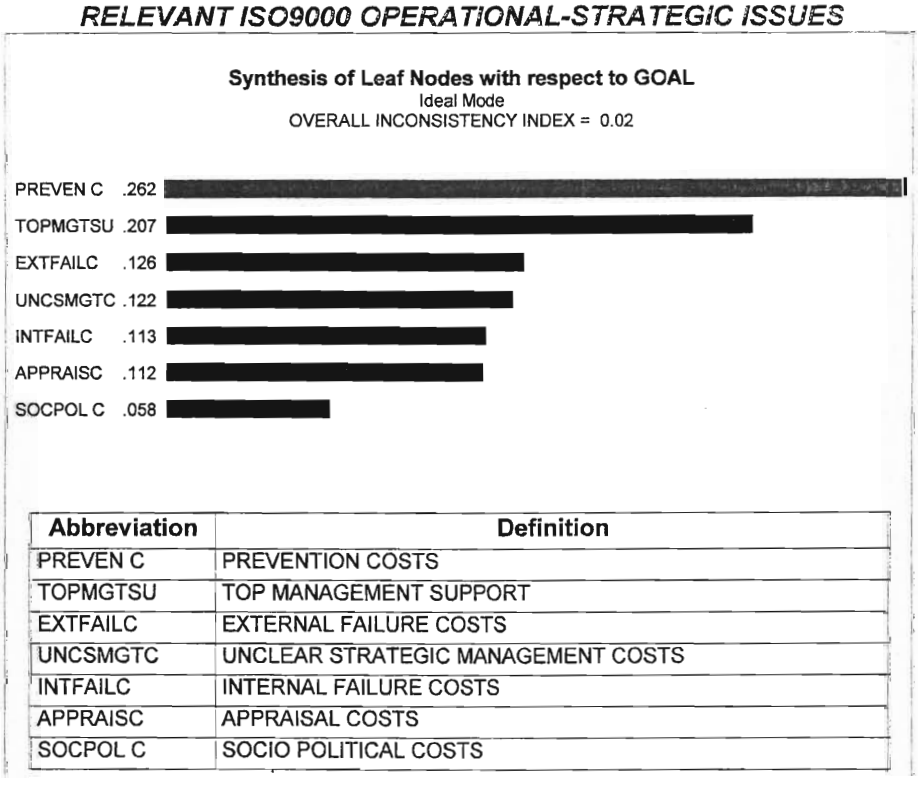
5.8.3 AHP RATINGS OF THE ISO 9002 AND 14001 COST FACTORS

The 13 main Cost factors of the ISO 9002 and ISO 14001 instruments were rated pairwise using AHP. The results are shown in **Figure 5.6,** for the ISO 9002 factors and in **Figure 5.7,** for the ISO 14001 factors. Although minor differences between the prioritisation of factors are visible for the two cohorts, the general tendency is to support the findings from the surveys on ISO 9002/14001 cost factors, namely that the views of managers from both groups largely agree on the priorities regarding quality management issues.



Abbreviation	Definition
PREVEN C	PREVENTION COSTS
EXTFAILC	EXTERNAL FAILURE COSTS
TOPMGTSU	TOP MANAGEMENT SUPPORT
UNCSMGTC	UNCLEAR STRATEGIC MANAGEMENT COSTS
INTFAILC	INTERNAL FAILURE COSTS
APPRAISC	APPRAISAL COSTS
SOCPOL C	SOCIO POLITICAL COSTS

FIGURE 5.6A: AHP RATINGS OF THE ISO 9002 INSTRUMENT - SEMI/NON-ISO TEAM



Abbreviation	Definition
PREVEN C	PREVENTION COSTS
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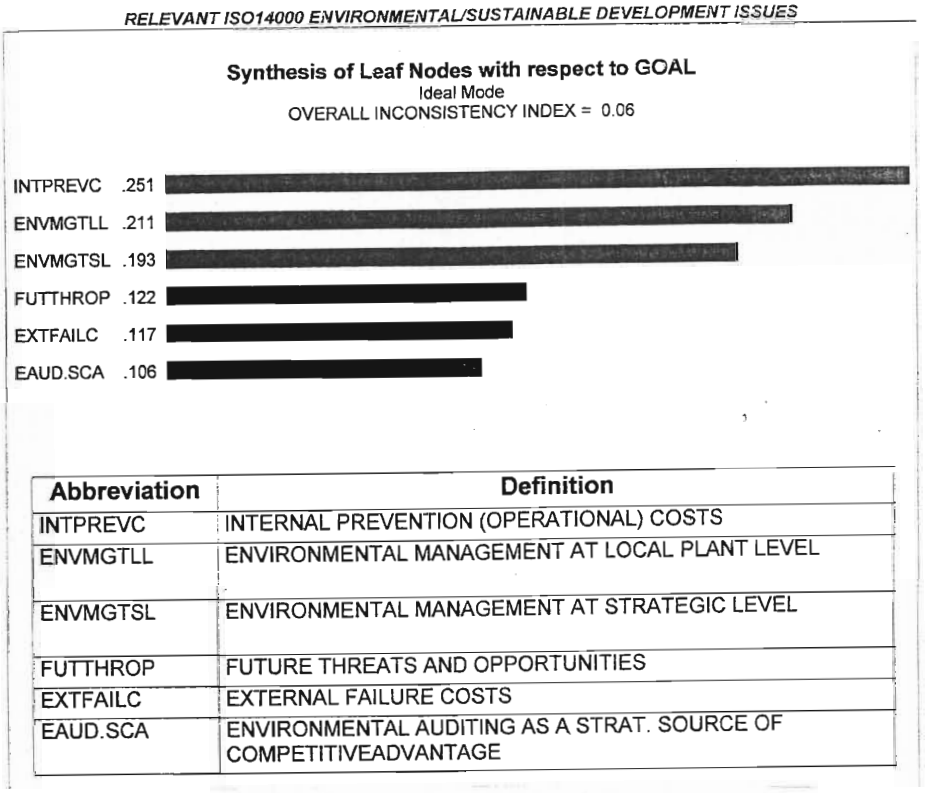
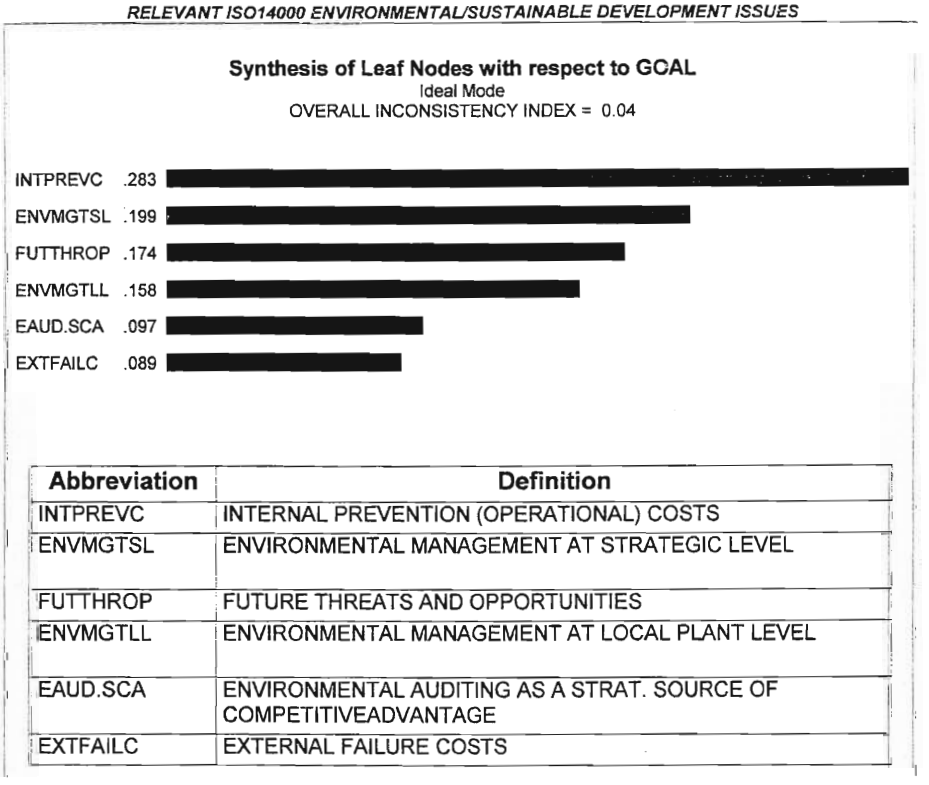
UNCSMGTC	UNCLEAR STRATEGIC MANAGEMENT COSTS
INTFAILC	INTERNAL FAILURE COSTS
APPRAISC	APPRAISAL COSTS
SOCPOL C	SOCIO POLITICAL COSTS

FIGURE 5.6B: AHP RATINGS OF THE ISO 9002 INSTRUMENT - ISO TEAM



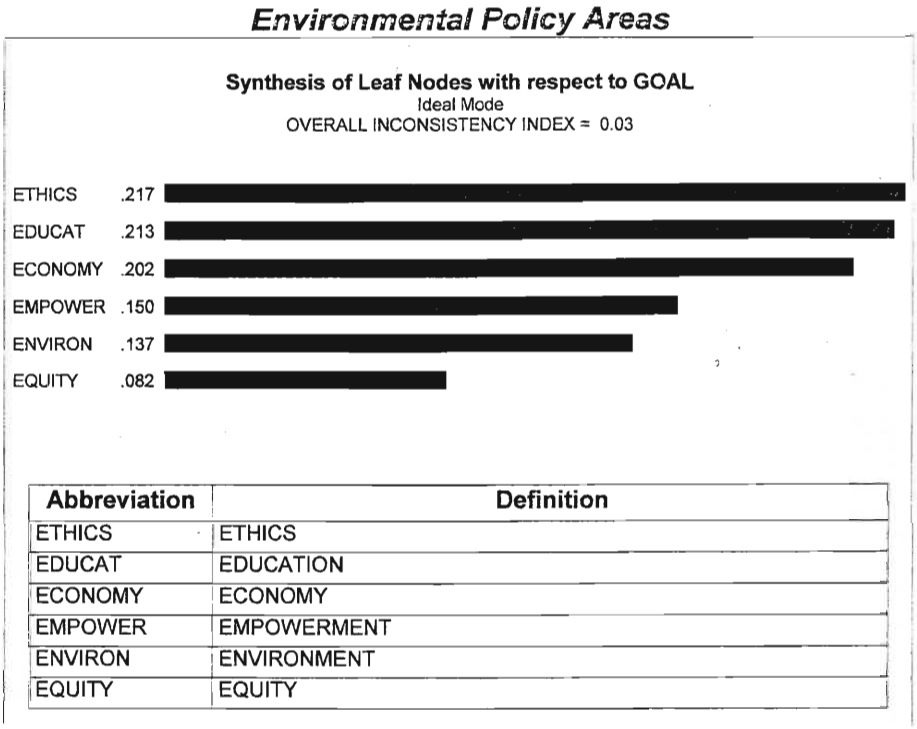
Abbreviation	Definition
INTPREVC	INTERNAL PREVENTION (OPERATIONAL) COSTS
ENVMGTLL	ENVIRONMENTAL MANAGEMENT AT LOCAL PLANT LEVEL
ENVMGTSL	ENVIRONMENTAL MANAGEMENT AT STRATEGIC LEVEL
FUTTHROP	FUTURE THREATS AND OPPORTUNITIES
EXTFAILC	EXTERNAL FAILURE COSTS
EAUD.SCA	ENVIRONMENTAL AUDITING AS A STRAT. SOURCE OF COMPETITIVEADVANTAGE

FIGURE 5.7A: AHP RATINGS OF THE ISO 14001 INSTRUMENT - SEMI/NON-ISO TEAM



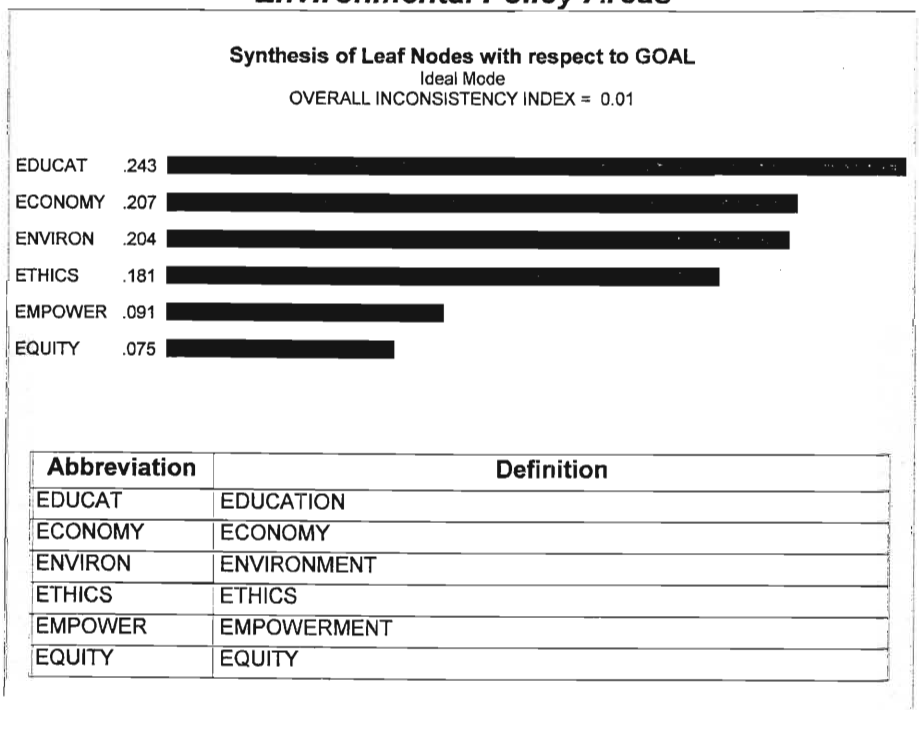
Abbreviation	Definition
INTPREVC	INTERNAL PREVENTION (OPERATIONAL) COSTS
ENVMGTSL	ENVIRONMENTAL MANAGEMENT AT STRATEGIC LEVEL
FUTTHROP	FUTURE THREATS AND OPPORTUNITIES
ENVMGTLL	ENVIRONMENTAL MANAGEMENT AT LOCAL PLANT LEVEL
EAUD.SCA	ENVIRONMENTAL AUDITING AS A STRAT. SOURCE OF COMPETITIVEADVANTAGE
EXTFAILC	EXTERNAL FAILURE COSTS

FIGURE 5.7B: AHP RATINGS OF THE ISO 14001 INSTRUMENT - ISO TEAM



Abbreviation	Definition
ETHICS	ETHICS
EDUCAT	EDUCATION
ECONOMY	ECONOMY
EMPOWER	EMPOWERMENT
ENVIRON	ENVIRONMENT
EQUITY	EQUITY

FIGURE 5.8A: AHP RATINGS OF THE POLICY AREAS INSTRUMENT - SEMI/NON-ISO TEAM



Abbreviation	Definition
EDUCAT	EDUCATION
ECONOMY	ECONOMY
ENVIRON	ENVIRONMENT
ETHICS	ETHICS
EMPOWER	EMPOWERMENT
EQUITY	EQUITY

FIGURE 5.8B: AHP RATINGS OF THE POLICY AREAS INSTRUMENT - ISO TEAM

The similarities (for ISO 9002) are clear from the fact that both teams:-

(i) Place Preventative Costs at the top.

(ii) Place Socio-political Costs and Appraisal Costs in the bottom 2 positions.

(iii) Place Unclear Strategic Management Costs at position 4.

The similarities (for ISO 14001) are evident in that both teams:-

(i) Place Internal Prevention Costs at the top.

(ii) Place External Failure Costs and Auditing Costs in the bottom 2 positions.

The conclusion, reached from the survey instruments that the findings should help alleviate concerns about the possible negative impact on the transformation process by the reported differences seen in the OCI survey, is confirmed by the similarities between the two teams of this workshop in the AHP ratings of the cost factors.

Examining the AHP priority ratings closely delivers up some interesting points. First, the Prevention Cost issues are rated top priority by both cohorts and for both ISO 9002 and 14001. This high priority placed on prevention is in line with the well established principle, in the Quality Costing literature ([Lundvall & Juran, 1974]; [Hendry, 1989]), that preventing quality (and environmental) problems is better than detecting and fixing defects at the end of the process, and is also in line with the TQM principle of Prevention instead of Inspection (2.3.2.1 (12) above). The degree of agreement amongst the participating managers is encouraging for the transition process toward TQM.

Second, Appraisal Costs (ISO 9002) rated low by both cohorts, although the relative importance is higher in the ISO groups case. The responses recorded in the ISO 9002 Survey Instrument were high, however. This discrepancy will be dealt with later. Third, the External Failure costs for ISO 9002 were rated high by both groups, with the ISO cohort rating it at position 3 while the Semi/Non-ISO group rated it second. Clearly, the costs involved in customer dissatisfaction is seen as important, showing the acceptance, on the part of the participating managers, of the crucial importance of satisfying customer demands as a main pillar of quality management and TQM (2.3.2.1 (7) above). But, this emphasis is not found in the ratings of External Failure

Costs regarding ISO 14001. Not only is this probably due to a view that the external environmental stakeholders are not to be afforded the same 'attention' as that afforded paying customers, but it seems out of line with the rating of Community Expectations (4.53) as needing attention, registered at the first workshop. This difference does highlight the 'messy' nature of a TQM model including both quality and environmental management in a world of diverse stakeholder demands.

Four, an interesting reversal of expected relative importance was recorded, in the ISO 14001 AHP ratings, between the Environmental Management Costs at *Plant* and *Strategic* levels. The ISO cohort rated *Plant Level* at 4 (0.158) with *Strategic Level* at 2 (0.199), while the Semi/Non-ISO group placed *Plant Level* at 2 (0.211) and *Strategic Level* at 3 (0.193). This seems contra to the intuitive argument that the ISO group, as directly involved in the day-to-day plant operations, rates this less important than the strategic management issues, while the Semi/Non-ISO cohort, although more closely related to the external and strategic management issues, rated the local plant level issues as more important. The rating difference are, however, small and probably not significant, therefore probably not warranting any serious consideration in the process to achieve TQM.

The objective of the second workshop was to advance the process started in the first workshop. During Workshop 1 two cost related issues were raised and rated during the Issues rating. These were (i) Cost of Non-Conformance (5.25) and (ii) Costing of ISO 14001 Implementation (4.32). These specific issues were not addressed, as such, during the second Workshop but the necessity of considering cost/benefit implications implied by them was expanded to a comprehensive cost/benefit view of both ISO 9002 and ISO 14001 implementation. The big protagonist of Cost of Non-Conformance is Crosby [1979, 1984]. According to him the Cost of Quality is divided into two areas - the price of non-conformance (PONC) and the price of conformance (POC). Prices of non-conformance are all the expenses involved in doing things wrong. This includes the efforts to correct salespersons' order when they come in, to correct the procedures that are drawn up to implement orders and to correct the product or the service as it goes along, to do work over, and to pay for warranty and other non-conformance claims. When all these are added together it is an enormous amount of money, representing 20 percent or more of sales in manufacturing companies and 35 persent of operating costs in service companies [Crosby, 1984 : 85]. Price of conformance is what is necessary to spend to make things come out right. This includes most of the professional quality functions, all prevention efforts, and quality education. It also covers such areas as

procedural or product qualification. It usually represents about 3 to 4 percent of sales in a well-run company [Crosby, 1984 : 86]. The two issues raised at the first Workshop can be identified with these two aspects of Quality Costs, as defined by Crosby, if it is remembered that *Costing of ISO 14001 Implementation* would be the costs to set up and maintain an Environmental Management System and its associated controls, and as such represents Costs of Conformance to Environmental standards. The relative degree of perceived urgency and importance, as rated at the Workshop, is in contrast to the figures quoted by Crosby [1984] of PONC to POC ratios of about 10:1. On the one hand this could be perceived as an area of concern if Mondi managers are not made aware of the value of improved quality and environmental performance to company financial performance. On the other hand, the high rating of Prevention Costs registered at the second Workshop, for both ISO 9002 and ISO 14001, does indicate that the participating managers understand that non-conformance prevention is an important issue. The apparent discrepancy between the ratings during the first and second Workshops is probably due to the different foci of the Workshops. In Workshop 1 a broad multi-criterial approach was taken and the 2 cost issues raised were not discussed in depth, neither were they rated in a comparative way. This could have resulted in the 'erroneous' view that the costs of achieving ISO 14001 need greater attention than the costs that could be incurred if the required environmental performance is *not* achieved. The second Workshop, however, focused on cost issues exclusively and the different cost categories were discussed in more depth. Further, the cost factors were rated relative to each other, via AHP, most probably resulting in a more 'realistic' appreciation of the value (in monetary terms) of sound quality and environmental management. If this could be substantiated, it would imply that organisational learning was affected via two traditionally functionalist methodologies, namely surveys and AHP and not only via Interpretive methodologies (like SSM) as claimed by Fishman [1997] and Roos [1996b].

5.8.4 SUMMARY OF THE SECOND WORKSHOP FINDINGS

The second Workshop sought to advance the process, started at the first Workshop, by concentrating on a cost/benefit approach to TQM. The similarities between the two cohorts, as illustrated in both the survey responses and AHP ratings, indicated a coherent approach amongst the participating managers. This is in contrast to the apparent divergence found, between the ISO and Semi/Non-ISO groups, in the earlier OCI survey. The Workshop also heightened appreciation of the different cost factors relevant to quality and environmental management.

5.9 DISCUSSION OF THE THIRD WORKSHOP FINDINGS

5.9.1 INTRODUCTION

This Workshop followed the same format as was done during Workshop 2. A different model based on policy areas identified as important for sustainable environmental management [Welford, et al, 1998] was used. The participating managers were asked to complete an original survey instrument [McEwan, 1998b] and rate the various policy areas using AHP. Managers, who attended the first Workshop, but could not attend this one were asked to complete the questionnaires and AHP rating forms as part of the subsequent data gathering exercise.

5.9.2 STATISTICAL FINDINGS RELATED TO THE ENVIRONMENTAL POLICY AREAS

Table 5.9c lists the statistical results from the survey instrument. No significant differences were recorded between the two cohorts. The difference of means for the area *Economy* is close to being significant at 95 % level with the critical value being 1.977. The direction of the difference with the expected higher value registered by the ISO cohort. The Semi/Non-ISO group included 2 managers from the financial and commercial department that could have raised the rating of Economical aspects in this group. The similarities of the ratings between the cohorts further indicates a convergence of management opinion and hence agree with and strengthen the conclusion drawn at the Second Workshop discussion that the differences between these groups, as highlighted by the OCI survey, is not apparent either from a cost/benefit approach or when the policy areas for sustainable development are being used.

5.9.3 AHP TECHNIQUE FINDINGS RELATED TO THE ENVIRONMENTAL POLICY AREAS

The similarities found between the survey scores of the ISO and Semi/Non-ISO cohorts are not found in the AHP ratings of these Policy Areas. The only one similar area is that of Equity, rated lowest by both groups. The differences are more interesting. First, the rating of Education as highest (0.243) by the ISO group and second (0.213) by the Semi/Non-ISO cohort indicate an agreement on the part of the participating managers

to the importance of training and education. The emphasis placed on education could be expected from the latter group with 30 % of the respondees being Training and Human Resource Management representatives. The high rating by the ISO-group is encouraging for three reasons; (i) The similarity of priority placed on Education by both cohorts; (ii) The high rating from an area of management not traditionally seen as 'people orientated' even to the extent that it rated higher than the traditional orientation ascribed to such managers, that of Economy (0.207) and (iii) The agreement of this emphasis with the high priority placed on training and education in TQM literature (2.3.2.1 (4) above). Clearly, the importance of education is recognised as the vehicle to improve not only quality but also environmental performance at Mondi Kraft.

A second issue relates to the possible conflicting objectives of economical and environmental points of view. This problem is widely recognised (cf [Petkov, et al, 1998]). The similar emphasis placed on these two areas by the ISO cohort is noteworthy, rating Economy at 0.207 and Environment at 0.204. The managers in this group reconciled these traditionally divergent objectives well. The Semi/Non-ISO group tended to rate Environment lower (0.137) as compared to their rating of Economy at 0.202. The ISO cohort could be expected to be more sensitive to the demands of environmental management, as this is seen as a 'technical/production' problem but the full support of the 'softer' departments would be crucial to the success of any progress toward TQM where Environmental management is included. Third, the high rating of Ethics (Position 1) by the Semi/Non-ISO cohort will be discussed soon.

5.9.4 SUMMARY OF THE THIRD WORKSHOP FINDINGS

The third Workshop advanced the process further by testing management views regarding different Policy Areas requiring simultaneous attention to achieve sound environmental management and sustainable development. The Workshop heightened management awareness of the multi-criterial nature of TQM, clearly underlining the fact that several, often conflicting, objectives need simultaneous management attention. The similarities in survey scores between the two cohorts affirmed the outcome of the second Workshop regarding management's seemingly unified view of which issues need attention on the road to introducing ISO 14001 into the existing ISO 9002 system. The AHP ratings indicated a good balance between economical and environmental concerns on the one hand and human development (education) and economical concerns on the other.

5.10 CONCLUSION

In the earlier chapters a theoretical multi-method framework was presented based on several TQM and systems perspectives identified in the literature. In this chapter an action research process, in which this framework was used in a real organisational transition from ISO 9002 to a joint system based on both ISO 9002 and ISO 14001. This chapter reported this action research project by describing both the research methodology and the actual interventions and data emanating from these interventions. It identified 5 problems experienced, by Mondi Kraft, while implementing ISO 9002 that would re-occur if a different implementation framework was not used for ISO 14001 and indicated that the implementation of the suggested framework should be evaluated against these problems. This research process and data were analysed, discussed and evaluated. Final conclusions, recommendations and items for further research will be discussed in Chapter 6.

CHAPTER 6
CONCLUSION : EVALUATION OF THE PROPOSED FRAMEWORK FOR INTEGRATING ISO 9002 AND ISO 14001

6.1 INTRODUCTION

Chapter 5 reported on the implementation of a multi-methodology framework at Mondi Kraft, Richards Bay Mill during 1997-1998. This Action Research project was discussed and analysed. What remains is to evaluate the process and identify specific recommendations that need to be presented to Mondi Kraft Management, together with suggested directions for possible further research.

6.2 EVALUATION OF THE FRAMEWORK

The evaluation will be carried out against the background of (i) Theoretical issues discussed for TQM in Chapter 2 and for Systems Theory in Chapter 3; (ii) Possible problems in TQM implementation identified in the literature; and (iii) Specific implementation problems identified by Mondi Management.

6.2.1 ORGANISATIONAL LEARNING

The objective of the framework implementation was to provide a suitable vehicle for organisational learning ([Garvin, 1993]; [Senge et al, 1994]) and the increase in awareness amongst managers of the important issues relevant to a process of achieving a joint ISO 9002/14001 system. The framework and its implementation should, therefore, be evaluated in terms of the success in improving awareness of both quality and environmental management; and in providing a mechanism for improved communication. Organisational learning is identified as involving both learning new 'tools' or 'skills' [Garvin, 1993] and thinking more deeply (and systemically) about current issues. The framework was successful in achieving the goal of organisational learning on both of these levels:-

6.2.2 ORGANISATIONAL LEARNING THROUGH THE INTRODUCTION OF NEW METHODS

The first area in which the framework affected organisational learning was that of introducing systems methodologies to Mondi Kraft Management. The three methodologies are already in use for some time in other countries and organisations, but not so well known that they could be regarded as common practice in South Africa; and none of these were known at the Richards Bay Mill. The framework, therefore, increased managerial knowledge by providing new problem solving and decision making tools. However, although the value of the framework implementation in supplying these new methodologies is recognised, this advance needs to be evaluated separately in terms of the degree of success achieved for each method.

(1) Strategic Assumptions Surfacing And Testing (SAST)

The success of introducing the SAST methodology was very limited. The principles of SAST were discussed and the most common applications were highlighted. However, the methodology was used in a limited way. The group of participating managers was not viewed as adversarial and their discussions were not regarded as constituting a dialectic debate, hence the decision not to employ SAST as a full methodology.

(2) Soft Systems Methodology (SSM)

The success of introducing SSM was higher than that of SAST. The introduction of SSM theory was followed by the actual use of the Rich Pictures and CATWOE aspects of the methodology. However, success was mixed in that more success was experienced in the Rich Picture analysis than in the CATWOE exercise. The limited time available for this exercise probably hampered adequate exploration of the explanatory power of this methodology, although this was partially achieved. After the first Workshop the Senior Human Resources Officer stated at the evaluation interview that he felt SSM could be used in handling problems experienced during Industrial Relations negotiations. He realised that the power of SSM lies in the formulation of a situation from different viewpoints and the seeking of consensus based on a clearer appreciation of the 'opposing' views.

(3) Analytic Hierarchy Process (AHP)

Of the three methodologies introduced the success of AHP was rated as highest by the participating managers. The technique was used at all three Workshops and a relatively clear understanding of the rating procedure using pairwise comparisons was obtained. The value of using AHP was recognised by some managers and at least three expressed enthusiasm for the future use of AHP at Mondi Kraft, ie the Mill Manager, Technical Manager and the Commercial Services Manager. That said, it must be stressed that a full understanding of all aspects of AHP, and the other two methods, would require a lot more time and effort than was available.

(4) Combination Of Methodologies

It has been argued in Chapter 4 above that the strength of the framework should be in the combination of methodologies so that the different strengths of an individual methodology could alleviate weaknesses in the others. The potential of the framework applied here lies in the combination of the interpretivist features of SSM with the social awareness concern of Critical Systems Thinking, plus the persuading power of an MCDM approach, which is traditionally seen as a functionalist tool. It is believed that such a combination can contribute to a meaningful change of attitudes in the social system, associated with the transition to compliance with ISO 14001 at the paper mill, because it provides a diversity of perspectives and promotes participation in the process. Unfortunately, this combination was never tested. No particular issue was followed through the process envisaged, ie structuring the problem using SSM and then evaluating specific decisions for action using AHP.

A combination of techniques that was not originally anticipated but was used nonetheless included surveys and AHP to elicit managers' views and priority ratings on a wide range of issues relevant to the process from ISO 9002 to ISO 9002/14001. Some evidence surfaced indicating the possible strength of both these methods to provide the opportunity for organisational learning. Some of the managers expressed the opinion that while rating the issues, their thinking was stimulated which led to an increase in awareness. This seemed particularly true, when rating issues pairwise (relative to each other) using AHP, when the relatedness of issues, previously seen as unrelated, was highlighted leading to a more 'holistic' view. This was not tested in this study because it falls outside of the current research focus. It could, however, be the subject of interesting research to check whether organisational learning can be affected by using

these two functionalist tools as discussed below.

6.2.3 ORGANISATIONAL LEARNING THROUGH ISSUES RAISED AT THE WORKSHOPS

The second facet of organisational learning relates to the issues raised by the use of the different methodologies and models used at the three Workshops during the framework implementation. The success of the framework can be evaluated against the five anticipated problems identified by Mondi Management.

(1) Holistic Focus To Drive TQM Implementation

The near exclusive emphasis on ISO 9002 as a marketing tool to satisfy customers was identified as a problem during the original ISO 9002 implementation and it was felt, by Mondi Management, that a broader focus should be adopted when ISO 14001 is introduced so that all relevant benefits could be stressed. At all three Workshops issues were raised, discussed and rated in which this holistic driving focus was evident.

At Workshop 1 the list of issues rated (see Table 5.2 above) included a number of issues relating to the driving focus, such as: Market Competitiveness, Legal Environmental Requirements, Community Environmental Expectations and Environmental Quality along with financial cost/benefit issues. In listing these issues the management team expressed acceptance of the fact that along with market and financial considerations, environmental considerations as defined by government, through legislation, and by the community, through lobbying, are all important aspects to consider in the drive toward TQM. At the second Workshop both of the models used were based on cost/benefit considerations and included costs that had to be incurred to achieve quality and environmental standards but also financial benefits that would accrue when these quality and environmental standards were met, leading to reduced scrap, rework and waste minimisation. Workshop 3 applied a model with a clear holistic focus. This framework has the advantage of placing more emphasis on social and ethical issues than many of the earlier approaches. This is consistent with the increasing acceptance of the need to address the social dimensions of sustainable development as much as the environmental ones. Six areas were identified: the Environment, Empowerment, Economics, Ethics, Equity and Education. These can be viewed as six areas where the business should have a clear policy and agenda for implementing change [Welford, et al, 1998]. The holistic

approach including social, environmental and economic aspects, clearly demonstrated the importance to the participating managers of considering all benefits when attempting a change towards TQM. In short, this objective of the framework, ie to emphasise the need for a holistic driving focus, was achieved by addressing financial, social and environmental issues alongside quality issues at all three workshops.

(2) Participation In And Ownership Of The TQM System

The methodologies introduced via the framework implementation all place importance on full participation. This is true for SAST and SSM as both are based on participation as a *principle* [Flood & Jackson, 1991] and for AHP because it provides the mechanism for the anonymous expression of different perceptions and views [Petkov & Mihova-Petkova, 1997]. Furthermore, a number of issues raised relate to participation. At Workshop 1, three issues were raised; namely, better communications, teamwork and the involvement of all employees. The latter two were rated the two most critical issues, clearly indicating the managers' view that participation is an important issue. Participation was also raised at Workshop 3 under the Empowerment area. The objective of raising awareness about the need for greater participation was therefore achieved.

(3) Honouring Multiple Views

The framework suggests that the more the principle of participation is implemented, the more multiple perceptions and viewpoints will become a problem. The inclusion of quality and environmental management into a common system (TQM) with the resulting increase in diverse stakeholders will also magnify the problem. As was the case above, all three the methodologies recognise multiple views ([Flood & Jackson, 1991]; [Petkov & Mihova-Petkova, 1997]) and the introduction of these tools must be seen as a success of the framework implementation. Issues were also raised during the first Workshop emphasising the importance of acknowledging different worldviews.

These included the environmental expectations of the community and the legal environmental standards set by governmental bodies, which not only differ between themselves but are often at loggerheads with the views and aspirations of organisational managers. A graphic illustration of the role played by this viewpoint in problem definition was found in the Rich Pictures drawn as part of the SSM introduction, and this was also evident in the low ratings of Community needs registered at Workshop 1.

(4) Overcoming Resistance To Change

No particular issue, theme or model was used to address this problem as such. The interpretive methodologies of SAST and SSM are claimed to be successful in cases where resistance to change exists but in this particular project this claim was not tested. The project did not address this issue for two reasons. First, the focus was on the improving of awareness as the prerequisite for change and not on the change process as such. This led to the approach of identifying, discussing and rating of issues, rather than an approach to *change* these views or perceptions. Second, the research project was more of a cross-sectional study [Saunders et al, 1997], in which the views and perceptions of managers at a particular time were recorded, rather than a longitudinal study in which the change of views and behaviour was traced over a period.

(5) Managing Multiple Objectives Simultaneously

Combining quality and environmental management, encouraging participation of all stakeholders and acknowledging various viewpoints will all lead to multiple, often conflicting, objectives; and the need to address these objectives simultaneously through trade-off management. The framework implementation sought to facilitate organisational learning not only by introducing AHP as a Multi-Criteria Decision-Making approach, specifically developed to assist in managerial decisions where such multiple objectives exist, but also through discussion and rating of a number of issues relating to multiple objectives. The issues, raised during Workshop 1, are the trade-offs required to balance market competitiveness criteria, legal and community environmental expectations and employee expectations in terms of participation and training. At Workshop 2 the multiple objectives of reducing costs while maintaining quality and environmental standards were raised. The model used at the third Workshop focused on broad policy issues and hence provided an integrated multi-criterial approach. Welford, et al [1998] indicate that ideally all the areas should be addressed to obtain sustainable development. The obvious trade-offs needed to balance the economic objectives with the social and environmental were clearly identified by the participating managers. In short, the implementation of this framework succeeded in creating awareness of the requirement to deal with multiple, sometimes conflicting, objectives and provided a tool, in AHP, to achieve valid multi-criteria decision-making.

6.2.4 THE APPARENT 'CONFLICT' BETWEEN ORGANISATIONAL COMPETENCY INDEX SCORES AND DEGREE OF ISO 9002 IMPLEMENTATION

The OCI survey instrument was not intended to form part of the research, but when the apparent 'conflict' between scores registered by ISO teams on the one hand and Semi/ Non-ISO teams on the other, became known the flexibility of the research design was utilised at the last two Workshops, not only to use the framework implementation to raise awareness and provide learning opportunities, but by stratifying the responses into ISO and Semi/Non-ISO cohorts, it provided Mondi Kraft Management with additional information on the magnitude of the apparent OCI/ISO 'conflict'. The absence of any significant differences recorded at these two Workshops alleviated concerns about the possible negative impact on the transformation process by the reported differences seen in the OCI survey. This outcome points to the utility of a multi-method approach and suggests that Mondi Kraft should investigate the use of the OCI surveys in future along more 'contingency' lines by recognising that organic structures (which would result in a high OCI score) and more mechanistic structures (low OCI score) could coexist if matched to the appropriate functions of different managers ([Burns, 1963]; [McEwan, 1996]).

6.3 RECOMMENDATIONS TO MONDI KRAFT MANAGEMENT

Mondi Kraft is fortunate in possessing an experienced and committed management team, because it has long been known that committed managers ultimately provide the best guarantee that the employees in their charge actually receive effective training, so that prescribed internal/external Quality and Environmental standards are achieved. It is against these standards that the company, its managers and all other employees, will be regularly benchmarked by leading stakeholders (including overseas buyers, government authorities, employee associations and trade unions, and the local community), who will all want to be assured that these minimum international standards are being implemented in the realistic, accurate, open pursuit of excellence at Mondi Kraft on a perpetual basis in future.

The participants attending the three workshops described in this study were, with one exception, all white, male managers at the Richards Bay paper mill. That said, the Transformation and Equal Opportunity policies of Mondi Kraft do not fall within the

focus of this study, however, attention must be drawn to the need for the wider involvement of a more representative sample of all employees if ISO 9002 and ISO 14001 procedures are to be introduced as part of the company's 'Pursuit of Excellence' strategy. In short, commonsense insists that compliance with both ISO 9002 and 14001 standards can only be achieved on a permanent basis by involving all employees at the Richards Bay paper mill.

The difficulties of achieving this involvement and transformation in the short-term are well-recognised and should not be underestimated. However, the political constraints imposed by previous governments which created socio-economic divisions between different racial groups, both in and outside the workplace, are now inimical to the new South African Constitution. It follows - and it is to the credit of the Mondi Kraft management team that they have already identified this pressing issue - that traditional communication barriers will have to be rapidly dismantled if the demand for transformation and empowerment, both inside and outside the company, is to be fully addressed across Mondi Kraft.

One positive step would be for senior management to recognise that wider participation of employees also provides an effective way of achieving 'competitive advantage' over rival companies. This is also known to be a relatively inexpensive way of addressing the legitimate aspirations of historically disadvantaged employees by providing them with essential practical training, skills and educational opportunities which relate directly to the activities undertaken every day in the office, workshop, or manufacturing plant. Cost-efficiency, competitive advantage and workplace relevance offer a concise explanation of why TQM programmes have achieved such widespread popularity among senior management across the globe during the past 15 years. A number of items are listed below as recommendations to Mondi Kraft Management. All of these should be of practical use to the company and as such represent important steps in the transition from ISO 9002 to ISO 14001 and address the involvement of different stakeholder groups.

(i) The Application Of SAST And SSM In Industrial Relations Matters

In Industrial Relations negotiations divergent and conflicting views are often encountered. The use of the two interpretive methodologies is suggested as possible tools in such negotiations. In particular the use of SAST is recommended. These negotiations are often adversarial of nature and SAST could be used to structure the

debate and to achieve consensus [Flood & Jackson, 1991]. In the changed environment of the new South Africa involving the unions in a frank and transparent way has become important. Any framework which could assist in achieving the participation of this important stakeholder group must be welcomed.

(ii) The Emphasis of Training As High Priority

Training was listed as an issue during Workshop 1 and confirmed in Workshop 3 when Education was rated as highest priority by both cohorts. Management hereby indicated its acceptance of the importance of training and education as prerequisites for successful progress toward TQM and the effective involvement of every employee at Mondi. Mondi Kraft has the opportunity to improve the practical knowledge and skills of its workforce so that they can all contribute to its 'Pursuit of Excellence' strategy. To achieve this, all employees first need to be made aware of the required Quality, Environmental, and Safety and Health standards, as well as acquiring other commercially important skills in human relations, computing, accounting, engineering technology, etc. This is no impractical pipe-dream, since recent legislation calls for specific training in the workplace which will increase empowerment, involvement and consultation, by involving all sectors of the workforce, but especially historically disadvantaged employees, who form the broad base of most South African companies. Astutely organised, these training provisions could coincide with improved marketing opportunities abroad, following the devaluation of the South African rand against the US dollar, UK sterling and other leading European currencies, even if the price of paper or pulp falls internationally because of the Asian 'economic crisis'. Admittedly, difficult strategic decisions will have to be taken in an increasingly turbulent global economy. Whatever happens, however, all Mondi Kraft employees will still need to be made more aware of the need to face up to external changes which will create growth opportunities, on one hand, and the need for stringent economies on the other.

(iii) The Application of AHP in Environmental Impacts Assessments

ISO 14001 requires that each facility or site establish and maintain aspects of the activities, products and services [Cascio, 1996] in order to determine those which have or can have significant impacts on the environment [ISO 14001 § 4.2.3]. Being able to identify the significant environmental aspects of a site's activities, products and services is a requirement to meet other ISO 14001 provisions (inter alia § 4.3.2, 4.3.3, 4.3.6 and 4.4.1). No standard approaches exist for determining 'significance', but AHP seems to

provide an excellent vehicle to rate environmental impacts where both management policy regarding what should qualify as significant and employee participation is sought. The variation suggested by Petkov [1994] on applying AHP should be used to provide a robust approach that would lead not only to justifiable ratings but also to a wide acceptance of the results because of the involvement of a large number of employees. The criteria used to determine the significance of an impact often require subjective evaluation and AHP's strength in providing the means to rate subjective criteria [Forman, 1998] should be utilised.

6.4 POSSIBLE AREAS FOR FUTURE RESEARCH

(i) Investigation Of The Framework In Terms Of The Inclusion Of OHS Management

The current research focused on integrating quality and environmental management. A similar argument can be made for the inclusion of Occupational Health and Safety (OHS) Management. Expanding TQM to include OHS Management, via the use of a similar Framework as presented here should be investigated. The link between quality and OHS management is made by Burrows [1997] and Linscheid [1994], while the link between environmental management and OHS management is made by Cascio [1996] inter alia. The areas of environmental and OHS management overlap to a degree. Many impacts and risks are difficult to clearly classify as either an environmental or an OHS risk. A system that provides for both these types of risks to be addressed in a common way would reduce costs by eliminating duplication and increasing coordination and the tendency to manage in a piecemeal way would be counteracted [Carruthers, 1996].

(ii) Application Of The Framework To An Extended Group Including External Stakeholders

The utility of the Framework should be tested in a project including stakeholders from the communities, government and customers. The framework should prove fruitful in a project where the diverse viewpoints of such an enlarged stakeholder group would require an approach with proven strengths in allowing different weltanschauugen to be stated and participation in reaching consensus is important. Unlike the management teams used in this study, involving a wide range of stakeholders will probably result in a debate characterised by adversary and the strength of SAST in providing structure to

such a debate using the Hegelian dialectic approach is recommended. Not only is the participation of these stakeholder groups a requirement of ISO 14001 (§ 4.3.3), but the 'open systems' approach demands that communication with and involvement of external stakeholders be constantly sought.

(iii) Application Of The AHP Models In TQM Implementation

A number of AHP Models were presented during the Framework implementation. The success of these and other similar models in the actual TQM implementation process should be investigated. A suitable vehicle promoting ecological modernisation in the enforcement of international standards governing quality and environmental issues like ISO 9000 and ISO 14000 is recommended. At a local level, these standards need to be operationalised into a set of working proposals and measures which ensures effective compliance. The AHP models will assist in this practical implementation of the different aspects of quality and environmental management, resource allocation and strategic decision making.

(iv) Investigate The Contingency View In Terms Of OCI And ISO Implementation

The mechanistic-organismic continuum proposed by Burns & Stalker [Burns, 1963] should be investigated in how it relates to and explains the differences found in OCI survey scores for teams where ISO 9002 had either been fully, partly, or not yet implemented. As indicated by McEwan et al [1998] different departments differ in the degree of routine and predictable work and according to the contingency findings of Burns and Stalker should also differ in the degree of mechanistic or organismic characteristics displayed. In line with multi-methodology principles neither the 'mechanistic' ISO 9002/14001 approach nor the more 'organismic' Organisational Competence Model should be regarded as sufficient on their own. These approaches must be integrated into a TQM system and the relative strengths of both methods utilised. The difficulty of such an integration must not be underestimated and this process should be carefully monitored to assess its success and practical value for the company. The integration of 'hard' and 'soft' aspects was earlier indicated as important in a TQM Model. Utilising both ISO 9002/14001 for the 'harder' and OCI for the 'softer' areas should provide the practical tools to achieve this.

6.5 SUMMARY

In seeking to clarify the complex problems associated with the transition from ISO 9002 to ISO 14001 at the paper mill, a combination of several techniques based on ideas relating to the Multi-methodology approach was recommended as a single technique methodology, because a model containing only a small portion of relevant factors is inadequate. The introduction of suitable frameworks for promoting ecological modernisation and compliance with international standards on quality and environmental management contained in ISO 9002 and ISO 14001 procedures is also advisable. Consensus on the most effective way of operationalising these standards in the paper mill is probably best achieved by introducing a forum for future discussion between managers which combines elements of SAST, SSM with AHP. It provides further perspectives contained in the ISO 9002 and ISO 14001 procedures, which are probably reflected in the different inventory responses on the Quality and Environmental Management cost factors, the environmental policy areas and also possibly in the separate OCI survey. The aim should be to incorporate these and similar survey results in a Multi-methodology framework which strives for greater clarity and consistency, by promoting group participation at all levels in the paper mill as an essential requirement of organisational learning on the identification and evaluation of key quality and environmental issues, and by giving a clear sense of direction on the multifaceted management of this 'messy' problem.

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APPENDICES

MONDI KRAFT WORKSHOPS ON ISO9000 AND ISO 14000 ON I APRIL 1998

1. INTRODUCTION:

2. RELEVENT ISO9000 OPERATIONAL-STRATEGIC ISSUES:

Very Important	Unimportant	Slightly Unimportant	Neither Important Nor Unimportant	Slightly Important	Important	Very Important
1	2	3	4	5	6	7

3. OPERATIONAL (INTERNAL) ISSUES:

For ISO9000 to succeed operationally, three types of costs have to be considered and evaluated from the possibly different standpoints of the various departments involved:

(i) Prevention Costs:

(a)	Identification of potential problems in your part of the operations	1...2...3....4....5....6....7
(b)	Correcting operations before these quality problems occur	1...2...3....4....5....6....7
(c)	Designing, costing and improving products and services	1...2...3....4....5....6....7
(d)	Ensuring tthese improvements reduce quality problems	1...2...3....4....5....6....7
(e)	Appropriate training and development of employees tto perform their jobs	1...2...3....4....5....6....7
(f)	Achieving required standards through quality control or audits	1...2...3....4....5....6....7

(ii) Appraisal Costs

(a)	Setting up appropriate acceptance sampling procedures	1...2...3....4....5....6....7
(b)	Calculating time and effort required for this inspection	1...2...3....4....5....6....7
(c)	Obtaining the actual data	1...2...3....4....5....6....7
(d)	Investigating quality problems relating to your part of the operations	1...2...3....4....5....6....7
(e)	Compiling and circulating suitable reports	1...2...3....4....5....6....7
(f)	Conducting both internal and external customer satisfaction surveys	1...2...3....4....5....6....7

(iii) Internal Failure Costs

(a)	Identifying and calculating cost of defective work in your part of the process	1...2...3....4....5....6....7
(b)	Calculating the cost of correcting errors and/or the reworking of materials	1...2...3....4....5....6....7
(c)	Calculating the cost of time lost in coping with these errors	1...2...3....4....5....6....7
(d)	Calculating time spent on 'trouble-shooting' rather than on improvement	1...2...3....4....5....6....7

4. STRATEGIC ISSUES

Again, for ISO9000 to succeed strategically, the following the following costs have tto be identified and quantitifed:

(i) External Failure Costs

(a)	The loss of customer goodwill from complaints affecting future business	1...2...3....4....5....6....7
(b)	The time spent in dealing with aggrieved customers	1...2...3....4....5....6....7
(c)	Litigation (or payments to avoid litigation)	1...2...3....4....5....6....7
(d)	The cost of guarantees and warranty	1...2...3....4....5....6....7
(e)	The cost of providing too much capability as materials to customers	1...2...3....4....5....6....7
(f)	The cost of providing too much capability as information to customers	1...2...3....4....5....6....7

(ii) Unclear Strategic Management Costs

(a)	Cost of unclear strategies or changing competetive priorities	1...2...3....4....5....6....7
(b)	Cost of not understanding impact of ISO9000 on competitive priorities	1...2...3....4....5....6....7
(c)	Cost changing staff roles/responsibilities to meet ISO9000 requirements	1...2...3....4....5....6....7
(d)	Cost of lacking resources needed to implement ISO9000	1...2...3....4....5....6....7
(e)	Cost of vague statements about company policy towards ISO9000	1...2...3....4....5....6....7
(f)	Cost of lack of consensus on implementation of ISO9000	1...2...3....4....5....6....7

(iii) Top-Management Support

(a)	Senior executives understand and believe in link between ISO9000 and the company's overall strategy	1...2...3....4....5....6....7
(b)	They understand the practical ISO9000 issues (eg. SPC)	1...2...3....4....5....6....7
(c)	They participate in problem-solving sessions to eliminate errors	1...2...3....4....5....6....7
(d)	They can formulate a clear idea of what quality means for the company	1...2...3....4....5....6....7
(e)	They maintain this quality policy over time	1...2...3....4....5....6....7
(f)	They do not scape-goat subordinates when quality problems arise	1...2...3....4....5....6....7

(iv) Socio-Political Costs

(a)	Consideration of cultural differences in introduction of ISO9000	1...2...3....4....5....6....7
(b)	Impact of language differences on adoption of ISO9000	1...2...3....4....5....6....7
(c)	Impact of old political dispensation on implementation of ISO9000	1...2...3....4....5....6....7
(d)	Effects of new political dispensation on ISO9000 adoption	1...2...3....4....5....6....7
(e)	Impact of unionisation on accepttance of ISO9000	1...2...3....4....5....6....7
(f)	Effects of "them and us" attitudes on adoption of ISO9000	1...2...3....4....5....6....7

MONDI KRAFT WORKSHOPS ON ISO9000 AND ISO14000 ON 1 APRIL 1990

RELEVANT OPERATIONAL-STRATEGIC ISSUES FOR EVALUATION BY PARTICIPANTS AT WORKSHOPS, AS SET OUT BELOW (CONTINUED)

INTRODUCTION TO ISO14000 ISSUES:

International environmental standards for business and the local community are mostly derived from the United Nations-commisioned Bruntland Report ('Our Common Future') published in 1987. Despite differences in opinions being expressed by some member-nations at the laatter Rio De Janiero conference, most countries accept ISO14000 (or similar domestic) standards as setting the 'yardstick' for European and North American countries, businesses and local communities for the 10-year period 1992-2002. The Bruntland Report advocates the following "Sustainable development" standards, which have since been introduced into the environmental legislation of leading industrial nations around the world. (N.B.Similar, updated South African environmental legislation is expected, probably in two-stages, in 1999 and 2000.)

5. ENVIRONMENTAL ISSUES

(i) Operational (Internal Prevention) Costs

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree Nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

		SCORE
(a)	The environment should be treated as part of the business process.	1...2...3....4....5....6....7
(b)	This means, the environment is not a "free good"	1...2...3....4....5....6....7
(c)	Environmental protection by business is essential	1...2...3....4....5....6....7
(d)	This requires minimal use of non-renewable resources	1...2...3....4....5....6....7
(e)	Efficient control of pollutant emission	1...2...3....4....5....6....7
(f)	More effective management of renewable resources.	1...2...3....4....5....6....7

(ii) External Failure Costs (requiring equitable treatment of "stakeholders")

(a)	Local community finds Mondi environmental standards acceptable	1...2...3....4....5....6....7
(b)	Mondi customers are satisfied with comany's environmental standards	1...2...3....4....5....6....7
(c)	Government authorities seek to impose more rigorous environmental standards	1...2...3....4....5....6....7
(d)	Environmental groups wish to take more 'severe' action than Goverrnment	1...2...3....4....5....6....7
(e)	Developed countries can meet new environmental standards at lower unit costs	1...2...3....4....5....6....7
(a)	South Africa should be allowed to catch up without incurring extra environmental costs	1...2...3....4....5....6....7

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(iii) Future Threats (and Opportunities)

(a)	Firms like Mondi take a 'short-term' view on environment for economic reasons	1...2...3....4....5....6....7
(b)	Government and Society want 'longer term' improvements in 'short term'	1...2...3....4....5....6....7
(c)	Environmental protection could therefore be compromised in South Africa	1...2...3....4....5....6....7
(d)	Longer-term plans must be adopted now to conserve environment	1...2...3....4....5....6....7
(e)	Business policies therefore need to be proactive, rather than reacting to events	1...2...3....4....5....6....7
(f)	ISO14000 offers the best way of accommodating these different "stakeholders'	1...2...3....4....5....6....7

6. CORPORATE RESPONSE TO SUSTAINABLE DEVELOPMENT REQUIREMENTS

(iv) Environmental Management at Local Plant Level

(a)	Mondi is meeting existing environmental commitments to its customers	1...2...3....4....5....6....7
(b)	Mondi also adheres to current SA environmental legislation	1...2...3....4....5....6....7
(c)	Mondi will cope with proposed new SA environmental legislation	
(d)	Concern for environment is a requirement for each Mondi operation	1...2...3....4....5....6....7
(e)	Mondi managers and employees are encouraged to see environmental improvement as a Company goal	1...2...3....4....5....6....7
(f)	There are clear, accepted ways in which all Mondi personnel are encouraged to become involved in implementing environmental improvement	1...2...3....4....5....6....7

(v) Environmental Management at Strategic Level

(a)	Mondi has the capacity of evaluate the environmental impact of its processess and products on its various stakeholders	1...2...3....4....5....6....7
(b)	Mondi is actively exploring new product opportunities which would impact more positively on the environment	1...2...3....4....5....6....7
(c)	Mondi is vulnerable to environmental issues such as climatic change, fire or chemical pollution, and has relevant contingency plans in place	1...2...3....4....5....6....7
(d)	Mondi has identified the financial and organisational constraints which would prevent environmental improvement taking place	1...2...3....4....5....6....7
(e)	Mondi's environmental performance can be turned into Competitive Advantage over rival companies in South Africa (and abroad)	1...2...3....4....5....6....7

(vi) Environmental Auditing as a Strategic Source of Competitive Advantage

(a)	The extent to which Mondi's environmental systems are performing well is known and publicised to stakeholders	1...2...3....4....5....6....7
(b)	Mondi compliance with SA and international environmental and health and safety legislation is known and can be independently verified	1...2...3....4....5....6....7
(c)	Compliance with Mondi's own corporate strategy is known and can be independently verified	1...2...3....4....5....6....7
(d)	Regular air, water and soil sampling occurs to assess impact on the local environment occurs and results can be independently verified	1...2...3....4....5....6....7
(e)	Environmental impact analysis data is available for inspection by stakeholders in the local community	1...2...3....4....5....6....7
(f)	Mondi actively seeks advice from independent experts on how it can implement sustainable environmental improvements.	1...2...3....4....5....6....7

1. INTRODUCTION:

Welford (1997) presents a framework for achieving sustainable development containing six policy areas and the related indicative tools which appear in the following survey instrument. Any business that seeks to implement sustainable environmental development policies would be expected to have an identifiable policy in each of these six areas, although it must be stressed that no firm will be expected to produce a perfect profile in each area. The aim of the survey instrument is therefore to identify progress in each area so that a degree of continuous improvement can be demonstrated over time.

2. POLICY AREAS

Strongly Disagree	Disagree	Slightly Disagree	Neither Agree Nor Disagree	Slightly Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

(i) Environment

(a)	Our working environment is being protected with minimum use of non-renewable resources.	1...2...3...4...5...6...7
(b)	Environmental performance is monitored and measured on a regular basis.	1...2...3...4...5...6...7
(c)	An environmental management system exists in the Company which includes regular audit activity.	1...2...3...4...5...6...7
(d)	Products are evaluated according to an approved life-cycle assessment.	1...2...3...4...5...6...7
(e)	Products are redesigned regularly to reduce their environmental impact.	1...2...3...4...5...6...7
(f)	Products also undergo a reliable functionality assessment to ensure the best way of providing product-benefits is used.	1...2...3...4...5...6...7
(g)	Strong connections exist along our supply chain which ensure that all stages of the product's life cycle are integrated.	1...2...3...4...5...6...7
(h)	Proper steps are taken to ensure that the use and disposal of our products is managed according to recognised standards.	1...2...3...4...5...6...7
(i)	Our company places emphasis on local community initiatives to ensure sustainable development is achieved.	1...2...3...4...5...6...7
(j)	Our company places much emphasis on the local action to ensure that the health and safety of all employees and neighbours is protected.	1...2...3...4...5...6...7

(ii) Empowerment

(a)	Every employee feels part of the process of empowerment	1...2...3...4...5...6...7
(b)	Every employee is empowered to act on their own obligations and work together closely with other colleagues.	1...2...3...4...5...6...7
(c)	Strong participation exists in the workshop with respect to decision-making, profit-sharing and ownership structures,	1...2...3...4...5...6...7
(d)	Our Company is open to new suggestions made by any member of the workforce.	1...2...3...4...5...6...7
(e)	Workers are rewarded if they make suggestions as well as for work done.	1...2...3...4...5...6...7
(f)	Human resources are valued by the Company and workers are not treated as factors of production.	1...2...3...4...5...6...7
(f)	Employee rights relating to equal opportunities and individual freedoms are enshrined within the Company.	1...2...3...4...5...6...7
(g)	In our Company diversity is encouraged and not stifled.	1...2...3...4...5...6...7

(iii) Economy

(a)	Our firm's economic performance is sustainable and provides for on-going survival and the provision of employment.	1...2...3...4...5...6...7
(b)	Our economic performance also provides for the payment of fair dividends to shareholders, and fair wages to all employees.	1...2...3...4...5...6...7
(c)	Financial audits are extended to include a justification of profits through good business practices than by cost-cutting exploitation	1...2...3...4...5...6...7
(d)	Periodic new investment occurs in both physical and human capital (through education and retraining).	1...2...3...4...5...6...7
(e)	Because our business relationships are mutually advantageous, stability exists in our supply chain.	1...2...3...4...5...6...7
(f)	Since jobs are central to sustainability, the provision and growth of employment is encouraged by our Company.	1...2...3...4...5...6...7
(g)	The products we make are of good quality, durable and suitable for the purpose for which they are intended.	1...2...3...4...5...6...7

(iv) Ethics

(a)	Our organisation has a clear set of published values which it reassesses periodically through the social-audit process.	1...2...3...4...5...6...7
(b)	Our Company is at all times honest and open about its ethical values, and provides evidence relating to any activities which are being challenged.	1...2...3...4...5...6...7
(c)	We are a transparent organisation and have clearly defined relationships with head office, subsidiaries, contractors and other agencies.	1...2...3...4...5...6...7
(d)	Ethics in our organisation are not declarations of intent but exist in practice as codes of practice, education, information and communication programmes.	1...2...3...4...5...6...7
(e)	Our business activities are ethically justified because it can be shown that we meet the legitimate concerns of the maximum number of our stakeholders.	1...2...3...4...5...6...7

(v) Equity

(a)	Equal rights and opportunities are made available to all of our employees.	1...2...3...4...5...6...7
(b)	Trade with local suppliers and buyers along our supply chain operates in an equitable manner.	1...2...3...4...5...6...7
(c)	Our international trade is also equitable and does not act against the interests and human rights of workers in developing countries.	1...2...3...4...5...6...7
(d)	The revenue accumulating as value added from the sale of our products is equitably distributed amongst our suppliers, at home and overseas.	1...2...3...4...5...6...7
(e)	Initiatives exist which ensure that technology and know-how is transferred to our historically disadvantaged suppliers, both at home nd overseas.	1...2...3...4...5...6...7
(f)	Sponsorship, charitable donations and development aid is also provided to our historically disadvantaged suppliers, both at home and overseas.	1...2...3...4...5...6...7

(vi) Education

(a)	Our Company recognises that education is at the heart of the sustainable process.	1...2...3...4...5...6...7
(b)	The sustainable development process depends on our being able to communicate the challenge to our stakeholders and educate them to live in a more suitable way.	1...2...3...4...5...6...7
(c)	Our Company has to accept its role as an educator because of its close links with employees, suppliers and customers.	1...2...3...4...5...6...7
(d)	Our Company should provide suitable information and education to all employees and to everyone purchasing its products both at home or overseas.	1...2...3...4...5...6...7
(e)	We should work closely with non-governmental agencies and campaign groups, through sponsorship, etc., to raise awareness about sustainable development.	1...2...3...4...5...6...7